IN THIS ISSUE: Electricity in the California Rice Fields

JOURNAL OF ELECTRICITY

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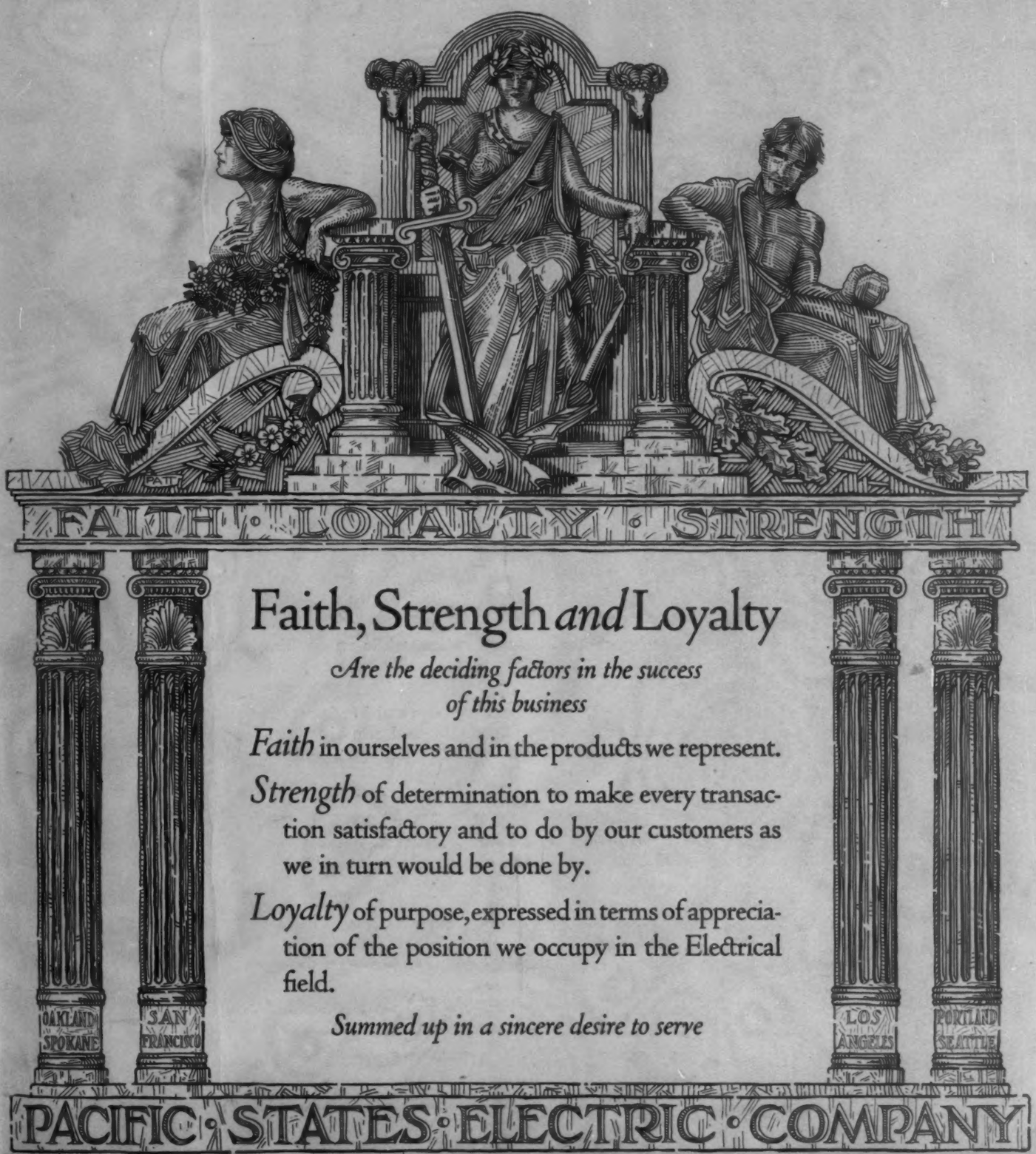

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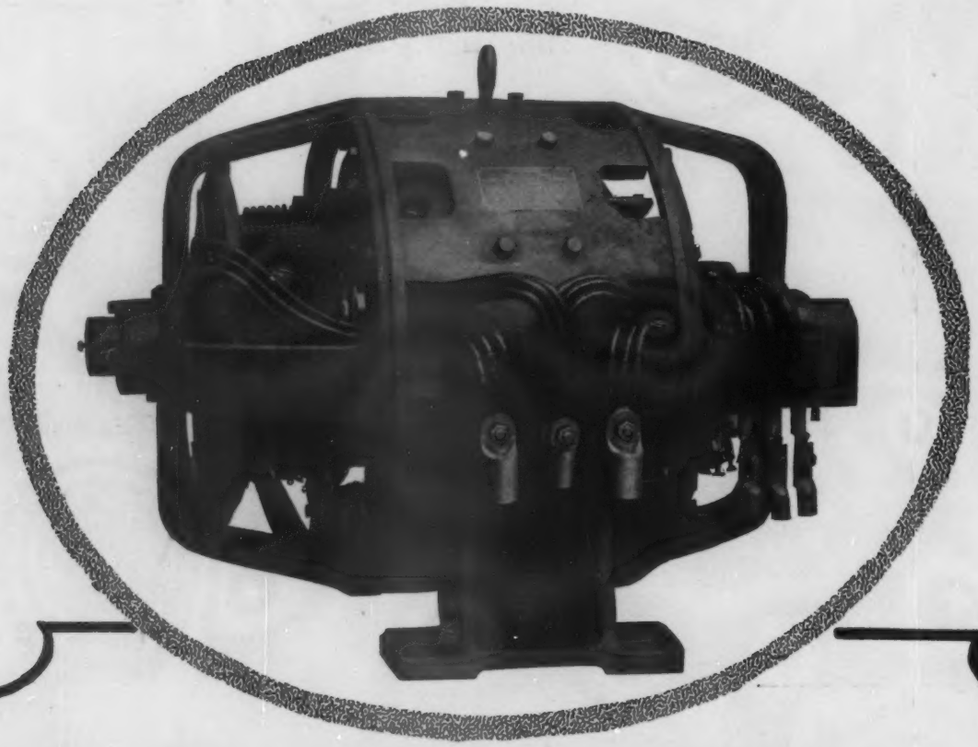

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

VOLUME 43 — SAN FRANCISCO, AUGUST 1, 1919 — NUMBER 3

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A NEW RECORD IN QUICK CONSTRUCTION

A truly remarkable photograph of perhaps the first tangible evidence of hydroelectric after-the-war construction work now in progress in the state of California—scene in the development of the San Joaquin Light & Power Corporation's new Kerckhoff Power House on the San Joaquin River in Fresno County.

This power house will have an output of 45,000 h.p. and work is now being rushed at fever heat to complete it as early as possible during the spring of 1920 in order to relieve the existing power shortage in the San Joaquin Valley.

The photograph shows the incline railroad leading from the top of the mountains to above the dam-site at the North Portal of the principal 8400 foot tunnel unit... This incline is 3000 feet in length and ascends a vertical distance of 1000 feet. At its deepest pitch, it records a grade of 85° and it is necessary to securely tie on materials on the railway cars. The track is standard gauge and the cars are operated by an electric hoist, propelled by 100 h.p. motor with a ⅞ in. special plow steel cable.

In the foreground is the river and the dam-site. The suspension bridge shows a diamond drill at work making borings of the bed-rock on the bottom. Immediately above the suspension bridge may be seen the North entrance of the 8400 foot tunnel. A huge concrete mixer will be installed at the mouth of the tunnel to handle the crushed rock in the mixture for the dam. The dam will be 400 feet at the top, 100 feet in height, and 50 feet at the bottom. It will contain approximately 30,000 cubic yards of concrete. It will back the water up a distance of two miles to the tail-race of the No. 1 Power House of the San Joaquin Light & Power Corporation, thus creating an artificial lake more than 2 miles in length and 100 feet deep. The lake will be called Kerckhoff Lake.

The picture shows the picturesque location of the camp on the hill side. The camp is declared by the California Commission of Housing and Immigration, to be the best in the State. The work, when completed, will cost $3,651,000 and the transmission line will cost an additional $1,000,000. R. C. Starr is the constructing engineer in charge of the work.

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AUG -8 1919

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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CONTACT—The One Great Avenue for Results

The splendid achievements of the Pacific Coast Section N. E. L. A., the California Electrical Co-operative Campaign and other movements in the West that are attracting such nation wide attention at present are in large measure due to the fact that perplexing problems of the day are handled in this section of the country in such a way that all branches of the electrical industry are conversant with the points at issue and organization is effected so that contact also is maintained with the public at large.

The big problems before our industry today are largely matters of the economic use of the resources of our nation, the electrification of steam railways, the utilization of our water power and fuel resources, and the bringing about of a close cooperation and understanding between those attempting to solve the problems and the public served.

In forwarding this mutual understanding and close contact with the public, the geographic idea in its working on the Pacific Coast has had a most decidedly helpful influence. A. E. Wishon, president of the Pacific Coast Section N. E. L. A., elsewhere in this issue forcefully recounts the distinct achievements that have thus been accomplished in the West during the past two and one-half years. R. H. Ballard, president of the National Electric Light Association, is now endeavoring to nationalize the entire scheme of association activitiy agreeable to these triumphs that have been attained in the geographic section idea in the West, and it is believed that such policy as this is far-sighted and truly to be commended.

Member Companies the country over will do well to study into the method of contact that is thus employed in the West, for when this is done, it is believed President Ballard's plan of a nationalized geographic section ideal will receive unanimous endorsement everywhere.

The Desirability of Engineer Clubs

A plea for increased dues which comes from the Engineers' Club of San Francisco, calls attention to the excellent service which clubs of this nature on the Pacific Coast have rendered.

An efficient engineers' club readily becomes the center and home of engineering activities in whatever community it serves. Not only does it provide a central meeting place for engineering organizations and make possible such friendly additions to a society's program as a luncheon round table, but it brings the unattached engineers into the group. It makes for better feeling within the profession and through the opportunity for general discussion of current problems, for the greater unanimity of thought and action of the engineers as a group. The engineer who is at home has an attractive and appropriate place in which to entertain an engineering visitor and the visitor finds among the daily gathering just the men he wishes to meet. So important and useful is this institution that the standing of a community in the engineering field is very apt to be judged by a stranger on the basis of the Engineers' Club it supports.

Not only is this true when judged from without, but the position of the engineer within his own commonwealth is greatly helped by the strength of the group with which he is associated.

As pointed out by the finance committee of the San Francisco club, engineers have learned from their laboring friends that in organization there is strength and will not be slow to maintain a medium which means so much to them in keeping abreast of the growing opportunities of their profession.

Electricity Makes Possible New Industry

Since 1912 the rice growing industry of California has developed from nothing to a probable crop for 1919 of nearly ten million bushels. To those familiar with the low lying semi-flooded areas on which rice is grown in Japan and China, the fact that this crop is raised on some 150,000 acres of almost arid lands in the interior valleys of California seems incredible.

The answer to this, as to so many other of our modern miracles, is in large measure—electricity. There are some few localities where a convenient stream brings water direct to the land under gravity, but the greater extent of the lands in use are such that water must be pumped from wells or direct from the river or canal. Large electric pumping installations are the result, on a scale which marks a new era in individual farming operations.

An interesting feature in the growing of rice is that by preference it is grown on heavy alkali-type soil which is not suitable for any other purpose and for long was thought entirely arid. The astonishing growth of this industry has brought a new element into California agriculture—one for which electricity is largely responsible and which opens up a new field for electrical operation. The conditions of rice growing and the uses to which electricity is put in some of the larger installations are interestingly presented by W. E. Camp on page 102 of this issue.

New Records in Fuel Economy

For many months past engineers the country over have been watching with unusual interest the very excellent economy in fuel oil generation of steam power in Arizona. The three power plants in particular are those of the Inspiration Consolidated Copper Company at Inspiration, the New Cornelia Copper Company at Ajo, and the Arizona Copper Company at Clarkdale. In the first of these three steam power plants, all three of which are oil fired, the economy of the turbine plant is limited by the common steam pressure of from 175 to 185 lb., while the two latter plants are designed for 250 lb. pressure. The Inspiration plant is 25-cycle, 3-phase, 6500 volts, and on the other hand the New Cornelia plant and the Arizona Power Company's plant are both 60-cycle, 3-phase, 2300 volts, with estimated maximum loads of 12000 kw., 7500 kw. and 5000 kw. respectively.

An average economy was obtained for the month of September, 1915 at the Inspiration plant, while the plant was still under control of the engineers, of 289 kw-hr. per bbl. of oil as fired. At the new Cornelia plant the monthly report for December, 1918 shows 312 kw-hr. per bbl. of oil and in January, 1919 the average economy rose to 317.9 kw-hr. per bbl. of oil. At the plant of the Arizona Power Company during September, 1917 the final test covering 48 hours' operation in regular commercial service, under variable load due to the regulation of the hydroelectric system, a remarkable record of 333.3 kw-hr. per bbl. of oil was registered.

The account of these three record tests is given in full on other pages of this issue and once again engineers of the West may take pride in the fact that one of their number has established helpful records that add prestige to engineering attainment and at the same time a certain economic factor in power generation that is extremely timely and desirable.

The Strike Privilege and the Public Utility

A telephone strike is a public inconvenience. A strike of the employes of a city water company, or, under easily imagined circumstances, of a central station, would be a public calamity. Such instances as the loss of telephone service of recent days, of the electrical workers' strike which tied up Vancouver, B. C. a few months past, as well as the more distant disturbances of Winnipeg, serve as a warning that such possibilities exist.

There are certain public industries in which a strike would be disastrous and as inimical to public welfare as a wholesale desertion in the army. The cutting off of the water supply of a large city, for instance, should not lie within the power of any group of organized employes nor within the danger of a real injustice at the hands of the employer which the employe takes his only means to rectify. It is obvious that when any body, whether it represent labor or capital, is placed in a position where it can dictate terms to the public, it should be regulated.

A recognition of the right of this principle is what led to our present public utility commissions and other rate fixing bodies. The principle should be extended to wages and to labor conditions as well.

This does not mean that the employe should not at all times have some redress. But the solution seems to be in the establishment of some court or body analogous to our Railroad Commissions, before which grievances of public utility employes might be brought, whose judgments should be final and whose decisions should be enforced.

It is an anomalous situation when the public can determine that a street railway company may not charge a six cent fare, as they have in Denver—and when at the same time, the employes of that railway company strike for the higher wages which the company cannot afford to give without a greater income.

It is time that the question be given consideration. We do not need to wait for an actual strike of water company or electrical employes to realize that such a condition would be intolerable and should be forestalled by making other provision for the settling of disputes.

A Woman's Angle on Mentioning Prices

In the July 15th issue of the Journal of Electricity, an article by Robert Falconer pointed out the disadvantages of mentioning price too early in the selling argument.

The question is one which has been much discussed in merchandising circles and on which practice varies. The consensus of opinion of writers on the subject seems to be against the display of prices in window displays or, except incidentally, in advertising, but the retail trade itself maintains no such uniformity of practice.

A recent communication received by the Journal of Electricity from a woman purchaser of electrical goods who had read Mr. Falconer's article, presents a new angle of the argument and one of

particular interest—for, after all, it is the opinion of the customer which counts.

The customer in question agrees with Mr. Falconer in part. She recognizes, of course, that the only reason she is interested in electrical ware is because she has been educated to some extent through advertisements, in the convenience of electricity in the household. But she believes she is already educated:

"Personally I like to see prices in the window, and I believe it is true of most women. Of course, if I were shopping for a collar or a silk sweater I should go into the store just to look at their stock, but I seldom am attracted by an unlabeled exhibit. Prices are too high these days and I suspect the article is more than I can afford. On the other hand an object which appeals to me and is marked at a reasonable figure will often draw me into a store to buy something which had not been in my mind at all.

"I believe this is true of electrical goods as well. I think electrical conveniences are desired by every woman. There isn't a housekeeper who would not like to have her home completely outfitted with electricity—if it were not for the expense. I think it is true that electrical ware is usually less expensive than the public pictures it. A woman will struggle along with a laundress and a wash boiler in spite of any number of electric washing machine demonstrations in the window, convinced that such luxuries are too expensive for her purse. But let her learn that the machine costs only $125, particularly if it is pointed out to her that this can be paid in monthly installments not much greater than her present cost of laundry—and you will soon find her asking for a personal demonstration in her home.

"The mention of money may not sound well, but it is what is in all our minds and there are few women who begin to think seriously of any article until they know it is within their means. And those few would hardly be customers for electrical household helps."

A frank statement and one which deserves the careful thought of every retail dealer.

Farm Bureaus and Farm Use of Electricity

The farm bureau is an organization of farmers and ranchers who combine to promote agriculture and to better conditions of farming through cooperative study. This type of organization has been known in various forms and sometimes under other names, throughout a wide extent of the country, but in the West it has come to be so well organized and so universal that it plays a most important part in all movements for bettering farm conditions, among which, of course, the use of electricity is to be numbered.

In California alone there are 429 such community centers at which monthly gatherings are held with an average attendance of forty-one persons. These bureaus work definitely in cooperation with the farm advisors and provide the avenue by which results are passed on from the State University and State experimental farms to the farmers themselves. How much these state agencies have already done in spreading the gospel of a wider use of electricity on the farm is well recognized. The outline of a correspondence course in electricity for farmers which is briefed elsewhere in this issue is merely typical of such work.

At the present time nine counties are testing out "Farm Home Departments" in connection with the farm bureau, for the bettering of home conditions. Manufacturers of washing machines, electric ranges, vacuum cleaners, indeed of all household conveniences will not fail to see the value of such an organization for demonstrations and educational work. Already the farm bureau has become a focal point for progressive ideas and a public forum before which all persons may present their cases to the rural people. The case of electricity needs only to be openly presented to be won.

Use of words "Electrical" and "Electric"

The new Webster's Collegiate Dictionary and Webster's New International Dictionary fail to give any shade of difference in meaning between the use of the words "electrical" and "electric" and yet those of us who constantly mingle with men of the electrical engineering profession know there is a decided difference in usage.

For instance we hear constantly of an "electrical" engineer, never an "electric" engineer, and almost universally we hear of "electric" toasters and quite infrequently do we hear of "electrical" toasters. By study of such instances as these we are able to formulate a rule that will guide us in the most elegant or choice use of these words.

It would seem that the use of the word "electric" is preferred where a piece of machinery or apparatus is involved that is worked or operated by electricity and in almost all cases where inanimate things are to be modified. Thus we have "electric" current, "electric" baker (meaning a stove operated by electricity), "electric" trolley, "electric" supply company (a store that deals in "electric" supplies).

On the other hand, when matters pertaining to things or people connected with "electrical" affairs but not necessarily involving the direct use of electricity are considered, especially where people and organizations are described, the word "electrical" is preferred in its use. Thus we have "electrical" baker (one who operates an "electric" baking apparatus), "electrical" engineer, "electrical" supply jobbers' association, "electrical" contractors and dealers' association, "electrical" engineering profession, and among inanimate uses, "electrical" science, "electrical" affairs and such other instances as may be cited where electricity is not directly employed but which pertain merely to matters "electrical."

NEW JOURNAL SERVICE:—It is with particular pleasure that the Journal of Electricity announces a series of articles on public utility relationships by S. M. Kennedy, general agent for the Southern California Edison Company, to begin in an early issue. Mr. Kennnedy is perhaps better known than any other man in the industry for his constructive stand on central station problems of personal adjustment, both within the organization and between the utility and the public.

The series of articles on the Business Library by Miss Louise B. Krause, which has aroused such wide spread interest will continue through September, when it will be followed by a number of articles on the wider service of the Public Library to the business man. A comprehensive analysis of the principles of indexing and filing, of special interest to the library and the large business office will then be presented.

Detailed plans of vital importance to the power man and to the merchandising expert are also under way, of which announcement will be made later.

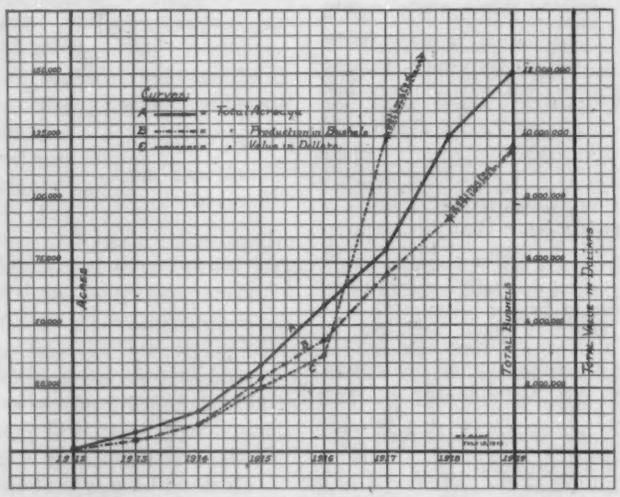
Electricity Makes Rice Industry Possible

BY W. E. CAMP

(A new industry dependent on electricity has ben developed in the West—and with it a new load of no mean proportions for the central station. The way in which the electric pump has transformed arid land into rice fields, partially flooded most of the year, rivals the proverbial blossoming of the rose. The author is intimately familiar with the conditions of the installations in connection with this new work.—The Editor

Twelve million bushels of rice were raised in California in 1918,—largely on land which is irrigated by water pumped electrically. The industry virtually began in 1912, when it was found that it was not necessary to grow rice on swamp lands, but that the crop could be cultivated in the central valleys of California, with the help of irrigation in sufficient quantity.

At the present time rice is grown principally in the following counties of the Sacramento Valley: Colusa, Glenn, Sutter, Butte and Yolo. Rice is now being grown successfully in other parts of California but the greater acreage is in the counties named.



RICE ACREAGE, PRODUCTION AND VALUE IN CALIFORNIA

The rice industry did not begin in the state until 1912 but has increased within seven years to an acreage of 150,000. The curves are based on figures from the U. S. Department of Agriculture reports.

Requirements of Crop

Irrigation is an important factor in rice culture. After the rice is up water must be applied continuously throughout the season, which means that a uniform depth must be maintained on the land from about May 1st to September 1st and sometimes later.

Soil

Most of the California rice is raised in black adobe soil, containing about 50% clay. The subsoil, usually at a depth of 3 or 4 feet is of tight, close formation, and more or less impervious to water. This has the advantage of providing storage and decreasing the seasonal amount of water required,—a vital factor when practically all of that water must be pumped.

Previous to planting, the land is arranged in contour checks, which are lightly flooded after the rice seed is drilled in. The water is drained after this to allow germination of seed. When the rice shoots have attained a certain stage, varying amounts of water are turned on the land which is then kept in a flooded state until the grain reaches maturity.

Irrigation

Probably most important of all considerations in growing rice is water. Rice requires plenty of water throughout the summer, the total requirements being very heavy.

From 4 acre feet to 6½ acre feet per season are required, depending on the location and nature of soil. For this reason wells cannot provide enough water for very large acreage. Many small tracts are successfully irrigated from wells, but the larger projects are dependent on river supply.

It is also a question as to whether cold well water might not be injurious to rice unless the water be pre-warmed by open air reservoirs.

Electric Pumps Used

All of the large rice projects along the Sacramento Valley secure their irrigation water from the Sacramento River. Large electric motor operated pumping stations on the river force the water out through the canals, in some cases a distance of 15 or 20 miles. In such cases it is necessary at various points to put in booster pumping stations to change the elevation of the water.

As water is the all important commodity in rice culture, much thought and engineering ingenuity have gone into these large irrigation works. Plants are laid out and constructed for reliability, permanency and efficiency. So important is continuity of operation that spare equipment is often held as insurance.

Sacramento River Plants

There are several plants along the Sacramento River that divert as high as 300 to 350 second feet of water each for a single project. Between Tehama and Knights Landing on the Sacramento River there are about 80 pumping plants with a combined total capacity of about 3300 second feet and requiring about 10,000 hp. of electric motors. This does not include booster plants in canals or projects deriving water from any source other than the Sacramento River.

Design and Equipment

Most of the large pumping stations of later design consist of concrete pits, concrete buildings, galleries for mounting all electrical starting and switchboard equipment, overhead cranes, electric motor driven priming pumps, electrically operated valves, etc. Most of the large pumps are direct connected to standard induction motors through flexible coup-

lings. The large motor equipment usually operates at 2200 volts and a station attendant is always in attendance to look after the various plant variables.

Pumps are usually of the horizontal centrifugal type, although vertical equipment can also be used.

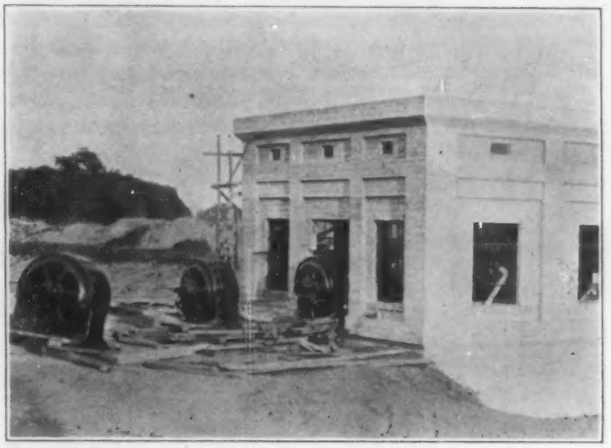
Low Heads

Practically all river pumping is moderately low-head duty, from 16 ft. to 23 ft. and the booster plants often operate against static heads as low as 6 feet. The screw type of pump has recently received favorable consideration for this booster duty.

A Growing Field

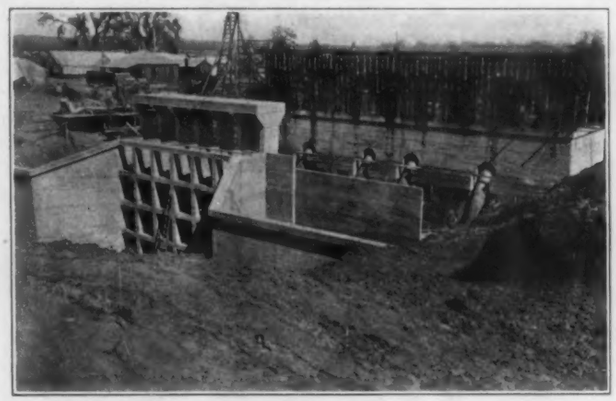
The rice industry in California is assuming large proportions, and the allied engineering problems in connections therewith—civil, mechanical and electrical—are worthy of the best talent.

SUTTER BASIN IRRIGATION PUMPING PLANT AT TISDALE WEIR
This plant has just been completed by Leonard F. Yandall, contracting engineer, Stockton, Cal., for this season's operation

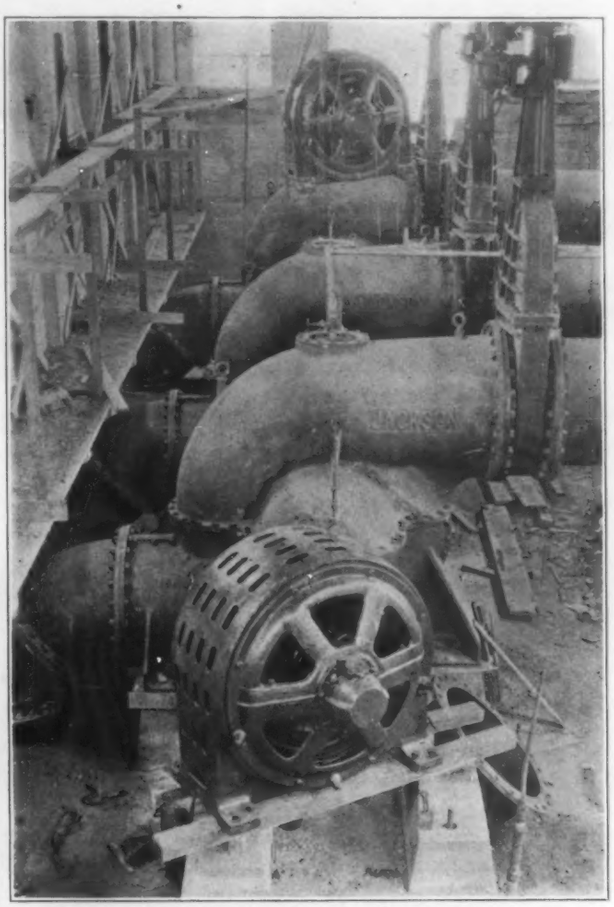


SKIDDING MOTORS INTO THE SUTTER BASIN PLANT
The installation consists of 3-250 h.p., 277 r.p.m., 2200-volt, 3-phase G. E. motors. The ultimate capacity of the plant is 6 units.

MAIN CANAL AND GATES—SUTTER BASIN
The water is taken from the Sacramento river and is lifted by electric pumps to the level of the rice fields

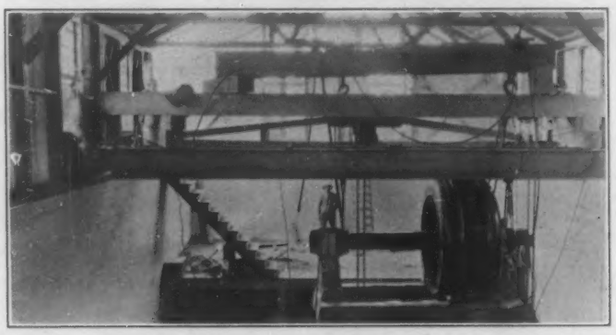


INTAKE GATES AND PUMPING PLANT DURING CONSTRUCTION
The magnitude of this installation at Tisdale Weir, under the Sutter Basin Co., is shown by this progress picture of the intake structure

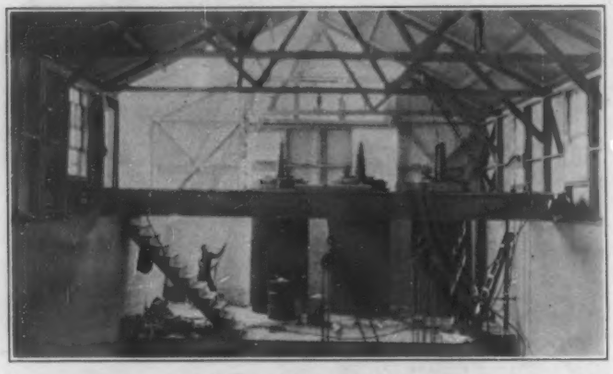


PUMPS AND MOTORS BEING INSTALLED—SUTTER BASIN
The three 42 in. Jackson pumps are in place and the motors just being installed. The normal head is 15 ft., the normal capacity of each pump 50,000 gal. per min.

THE PROVIDENT IRRIGATION DISTRICT PUMPING PLANT
This is another of the Sacramento river rice projects located at Sidds Landing. The discharge conduit is shown in the foreground.



INSTALLING THE MOTOR—PROVIDENT PLANT
Sixteen tons of motor is moving in ready for operating the 4—42 in. Jackson pumps. There are 4—500 h.p., 360 r.p.m., 2200-volt, 3-phase G. E. motors in this plant. The pumping head is about 17 ft.



TRANSFORMERS IN PLACE
Three 667 kva. 60,000 to 2200-volt G. E. transformers form part of the equipment. The total capacity of the plant when complete is about 500 second feet.

EMPLOYING AN ELECTRICAL FARM HAND

(A most complete electrical installation on a progressive farm which makes it possible for a farmer to do a much larger proportion of his work without assistance. An example of the advantages of electricity on the practical farm.—The Editor)

Farmers in Blackhawk County, Iowa, demonstrate emphatically that the use of electricity is just as much a matter of economy and convenience to them as it is to the millionaire in his "model farm." Farmers in this neighborhood on farms of all sizes have electricity lighting their house and buildings, pumping water, grinding feed, and running the dairy machinery. One of the most complete installations is that of J. W. Oltrogge, who lives near Readlyn.

The buildings are all of first-class construction, and are electrically lighted throughout. Over the door of the garage is a lamp which lights the walk from house to barn, and is controlled from four points. Thus there is no need of a lantern, as the light can be turned on at the house, and extinguished on reaching the barn. In the barn is a 7½ horsepower Westinghouse motor driving a Bowser feed mill. Experience has shown just where to set the slide gate in the feed-chute so that the mill gets just enough unground oats and corn, and so it runs without attention. Nearby is a 1 h.p. motor belted to a shaft formerly driven by a windmill. This shaft runs outdoors to a pump which delivers to a concrete tank from which pipes run to various watering troughs. One of these troughs which serves the beef animals, is placed in the wall of a shed so that it can be reached from without or within. Formerly there was trouble with this freezing, but a little immersion heater, taking 500 watts, effectively keeps the water ready to drink. Since there are about 150 head of cattle, the saving of this device is obvious. The motor-driven feed cutter, too, means no hauling of feed over heavy roads, and no shortage of ground feed at any time.

The house is well lighted throughout, and has a complete plumbing installation, supplied by a small rotary pump driven by a Westinghouse 1/3 h.p. motor. This pump delivers into a 3 ft. by 6 ft. pressure tank. In the laundry is a combined washing machine and wringer driven by a ¼ h.p. motor. In summer the kitchen is always cool for an electric range is used. This has three burners on top and an oven underneath. In winter, too, there is no fear of fuel shortage, and no delay should the range fire go out. Other household equipment is an electric iron, a sewing machine motor, and an electric vacuum cleaner. In the garage is a motor-driven grinder which keeps tools sharp.

Mr. Oltrogge has a farm of 320 acres, on which he usually feeds 150 head of cattle and 300 hogs. His electricity bill totals $8.00 to $10.00 per month. Current is purchased from Tegtmeier Bros., who operate a 2300 volt distributing system. As is customary in this community, each user pays for his share of whatever line connects with the nearest distributing line. He also pays for his transformer (in this case a 7½ kw. Westinghouse) and protective devices. Tegtmeier Bros. install the meters. The rate for current decreases with the amount used, thus making it easy for the farmer to run several motor driven devices. By their aid it is possible for Mr. Oltrogge with the help of one boy, to take care of his stock during the winter alone and in the summer to concentrate his time on really productive work.

In order to take full advantage of the latest electrical installations in canning and packing establishments the article on "Electricity in Fruit Packing," which was scheduled for this issue of the Journal of Electricity has been postponed to a later date and will appear subsequently in an early issue.

Selling the Farmer

BY RICHARD E. SMITH

(The type of salesmanship which is successful with the housewife may not be successful with the business man. In the same way the farmer has a particular outlook and a particular set of circumstances which must be taken into account by any salesman who would achieve success in a rural district. The author of this article is District Agent for the Mt. Whitney Power and Electric Company of Visalia, California.—The Editor.)

Now that the thoughts of the commercial world are turned towards the problems of reconstruction and the development of business in fields which formerly may have been overlooked, many of us are looking to the farmer as a consumer whose trade is desirable. This is particularly true in the electrical industry.

Many of the problems we are facing are also shared by the farmer. To him, the shortage of labor is very real and he will respond readily to any appeal which promises the more efficient and economical handling of his work.

This is not an attempt at a psychological study nor is the subject treated with any claim for authority. It is merely a series of opinions on the business methods of farmers based on the personal experience of one who has spent several years as the representative of a central station in a territory which is almost entirely agricultural. While these notes apply particularly to the electrical business, no doubt many of them cover other lines as well.

For convenience, the different phases of the subject will be treated in the order of their occurrence in a typical transaction, commencing with the "approach" and closing with collections. Before doing this, however, let us try to answer the common question, "Why is the farmer such a poor business man?"

The Farmer as a Business Man —

The average farmer is just as good a business man as the average in any other occupation; the trouble is that he has more responsibilities than the other average man.

Take a thousand men in the city and classify them. We find clerks, mechanics, street-car operators, laborers, policemen, letter carriers, teamsters—men whose native ability and acquired knowledge would not carry them far in the mazes of modern business. A very few in the thousand would come under the heading of "good business men."

Now take a thousand men in the country and note that each has to qualify as an all-round manager, who, in addition to the routine of raising crops, must frequently decide problems in law, accounting and finance. Looked at in this way the farmer grades higher than his city brother.

The Method of Approach —

In approaching any farmer as a "prospect" we should remember several things. An outstanding characteristic of people who live in rural districts is there extreme leisureliness. In the city where men crowd a day's work into a few hours we are accustomed to rapid action and quick decisions. The farmer's opportunities for social intercourse are limited and any business call is likely to develop into a lengthy visit.

A salesman who can talk intelligently about weather, crops and prices will find such small talk an excellent approach. If he knows something of Holsteins, Poland-Chinas and Hairy Peruvian, so much the better. Obviously, he should keep in an optimistic strain and avoid such subjects as grasshoppers, alkali, taxes and milk fever.

Another characteristic of the farmer is his wariness. There is a reason for this. For generations the rural districts have furnished a great harvest for the faker. Stock swindlers, quack doctors, lightning-rod agents and others of the smooth-tongued tribe have looked to the rustic as their rightful prey. As a result the farmer considers everyone guilty until proved innocent. Simplicity of dress and demeanor is the best method of overcoming this.

The Importance of a Reputation —

Any concern entering new territory must establish its integrity before it can expect many sales, and this is particularly true in the country. The fact that your company is generally known for square dealing, prompt replacement of defective parts and freedom from haggling, will lead to more sales even though the competing line can show certain alleged advantages over yours. "Bill Brown bought one of your seeders three years ago and it hain't never give him a bit of worry, and you know how Bill treats his stuff, leaving it under the oak tree all winter." Such earnest talk is music to the salesman's ears. When a farmer is considering the purchase of a new device he will speak to his neighbor about it and if it is an expensive appliance he will probably mention it to his banker. If these reports are favorable, little more in the way of salesmanship is required.

It is an easy matter to over-sell the farmer and as this always leaves an unpleasant after-taste, it should be avoided. It is the writer's opinion that salesmen working rural territory should always be on a straight salary basis. Commissions are sure to lead to unsatisfactory sales. Of course, this applies only to the firm desiring to become established in the neighborhood and not to certain specialties that are universally sold on the commission plan.

Cash Payments —

As a general rule the plan of selling on installments is not the best in the country. The man who depends on one or two crops receives his income in a lump and can pay for the new device at one time as well as another. If he cannot pay cash he will probably have difficulty with time payments. Another point is that the farmer who maintains the right relations with his bank can borrow money if necessary for the purchase of an appliance which will increase his revenue or reduce his operating costs.

The cash purchase is the most satisfactory transaction for all concerned.

Farmers are unusually fair-minded. If a dispute comes up concerning the terms of a sale, one has only to ask, "Well, now, what would you consider a fair settlement?" It will be found that the farmer will make a proposal in which he voluntarily concedes something and expects the other party to do the same. And nearly always what he suggests is all that anyone can ask. The result will be a cordial feeling that will last for years and have an immense value in establishing the dealer's reputation for squareness.

All farmers like to bargain. This evidently is the outcropping of the horse-trading instinct. Some salesmen recognize this and attempt to meet it by adding something to the price so that they can make discounts as the sale develops. Such a program is entirely wrong. "One price to all" is the only safe policy, and any variation from it will lead to trouble in either the country or the city. The first sale may be a little harder, but succeeding sales will be easier as the dealer's policy of marked prices becomes known.

Collections and Credit —

The dealer's collections should be followed closely. The typical farmer is inclined to let his accounts run till harvest time even though he have the money on hand for incidental expenditures. If a bill is due on the fifteenth it should be presented at that time, and not two or three days later. A little carelessness in this respect gives the purchaser the impression that there is no particular promptness required on his part. If payment is not made there should be an immediate and thorough understanding as to when it may be expected.

As the farmer is not accustomed to giving credit information about himself, more tact is required in extracting this than is necessary when dealing with the city business man. It will also be noticed that country banks are reticent in this respect. The best credit report can be made by the salesman and will be based on his observations on the ground.

Personal Work vs. Correspondence —

To get the best results, any transaction with rural trade should be by personal calls and not by correspondence. It has already been noted that the farmer has plenty of time to visit with a salesman but he has little time or inclination for letter writing.

The same thing applies to collections. It is much better to have some one call at the ranch than to write fancy collection letters. Then if payment is not made it is possible to get reliable, first-hand information for the files.

A versatile man will handle the rural trade intelligently and produce results. The man who works according to a plan that he learned in a book or follows a scheme outlined by a sales manager, who never worked in the country, is quite apt to be a disappointment. One thing is certain—the farmer offers a big market to the producer of finished goods, and the concern that enters the field properly prepared will reap the reward.

OWNING-YOUR-OWN-HOME IN PORTLAND

(Besides being of general importance to all citizens, the Own-Your-Own-Home Campaign has additional interest for the electrical industry in view of its connection with the house-wiring plans and the "Own-Your-Own-Home-Wiring" campaigns which are among recent electrical activities. Campaign schemes are various and interesting. This is how Portland does it.—The Editor)

In connection with the Own-Your-Own-Home campaign the city of Portland, Ore., with Mayor George L. Baker as general chairman, has evolved and carried out a very effective piece of work.

Through one of their public spirited citizens they secured for one year without charge the use of a 50 by 100 ft. vacant lot in the heart of the down town business district. The General Committee was successful in getting organized labor interested to the extent of donating sufficient labor to build a large bungalow about 40 by 85 feet, ordinarily costing about $8,500. The lumber association, plumbers, and other interests whose materials are essential to construction donated sufficient material for the building. Heat, light, and telephones were donated by the public-service corporations. The park board of the city planted the area around the bungalow with very rich shrubbery, including window boxes and sodded lawn. The bungalow was complete in all details—modern bath, large fireplace, and was completely furnished by the public-spirited furniture dealers of Portland. This building was and is now being used as headquarters for the Own-Your-Own-Home campaign. The building and grounds were finished about December 27, 1918.

In planning the opening of the campaign on New Year's Eve the committee hit upon the two ideas which were very appropriate for the occasion. One was a New Year's resolution to "Own Your Own Home in 1919." They had a number of cards printed to pass among the large crowd, and over one hundred signed up cards and left them at the bungalow the first night.

The second thought was a wedding. This offered a great opportunity for newspaper publicity. The secretary of the Oregon Industrial League assumed the responsibility of securing donations of presents from all manufacturers of Oregon furniture and food products. He was successful to the extent of having about $1,000 in presents donated to the prospective bride and groom. The presents were placed in the bungalow, where they remained for a week after the wedding.

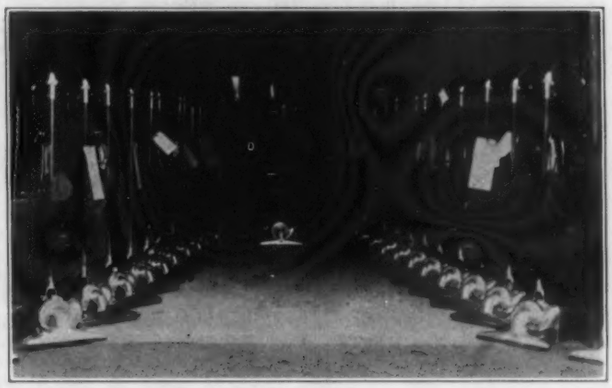
A popular pastor performed the ceremony and delivered a very fine sermon on the merits of the Own-Your-Own-Home movement and what it meant to the new couple to establish a firm foundation in life by building or owning a home of their own. The mayor, after the wedding, delivered a very practical address on what the home meant in stabilizing our Government. The secretary of the Oregon Industrial League, in presenting the presents to the bride and groom, gave a very live talk on what it meant to the community to use homemade products.

Handling a Solicitor Salesman Campaign

BY WALTER COX

(In view of the opportunity for obtaining solicitors opened to all contractor-dealers through the plan of the California Electrical Cooperative Campaign, this account of a successful sixty-day campaign, involving 2500 customers in one of the smaller California cities, is of special interest. The paper was one of the most important contributions read before the Contractor-Dealers' Association at the recent Santa Cruz convention. The author is proprietor of the Cox Electric Company of Santa Cruz, California.—The Editor.)

After studying the methods of the present day manner of handling a solicitor salesman campaign, I came to the conclusion that they are not far reaching or thorough enough, bearing in mind the fact that the contractor-dealer will, in the very near future, be compelled to keep a solicitor employed the year round in nearly all districts, and most especially where the central stations have turned over their



BACKING UP THE CAMPAIGN

The vacuum cleaner campaign was emphasized by this phalanx of cleaners at the entrance of the store. Strong newspaper ads and window displays were used to tie-in with solicitors' arguments.

retail business to the dealers. This being the case, a permanent record must be kept of each consumer of electricity, so that the follow-up system may be maintained by the solicitor and dealer.

We all know that a well placed appliance will eventually lead to the desire for another and that being the case, one of the objects of the solicitor salesman is to educate the public more quickly by giving home demonstrations.

Selecting Prospects

So, in order to bring this about in my own territory, I conceived the idea that we must first find out what appliances were being used in the territory, and what the various individuals were interested in. With this thought in mind, I secured a full list of meter routes with the names and addresses from the central station. These routes were given to girls with appliance literature, who made a call on every meter, and while the call was being made, a duplicate blank was filled in as to what appliances were being used, and were they satisfactory. If the one being called on was interested in any one particular appliance, permission was asked to allow a demonstrator to call at a stated time. By doing this, I have a record, in case a sale is not made, for follow-up work, and I have also created a greater desire for the appliance through the demonstration.

Advertising

While these calls were being made, strong newspaper ads were being used, also the appliances were featured in our windows as well as the central station. Unfortunately, quite a few were out at the time of the first call which necessitated covering a portion of the route the second time, but literature was left just the same.

In our vacuum cleaner pamphlet, we inserted, for reference, a list of those to whom we sold cleaners in 1918, and for this fall campaign a full list to date will be used. This, I find, is a good scheme.

All-Round Stimulation of Trade

While I was featuring cleaners, washers and ranges during the campaign, the sale of other appliances was stimulated beyond all expectations.

I might also state that 5 towns in this district have agreed to keep one man for one year between them, which insures a demonstrator a permanent position at a hominal guarantee per week.

In the past, and in a great many territories today, solicitors enter a district and, without creating a noticeable demand for new appliances, skim off the cream of trade that the dealer had previously created, thus destroying the incentive on the dealer's part to encourage a campaign of this sort.

Campaign Profits

After adding every expense that entered into the campaign, such as wages for girls, commissions to demonstrators, printing, advertising, freight and drayage, telephone and gasoline, I find that it cost 12.5% of the net profit; in other words I had a clear profit of 22.8% after cost of goods and overhead were deducted. The campaign has proved a tremendous success, not only in the matter of sales made during the campaign, but of sales made since.

IN THE BACKGROUND

Back of every solicitors' campaign, of course, must stand the guarantee of service of the store itself. Mr. Cox's attractive establishment is already well known to Santa Cruz central station customers, which fact gave his literature added force.

A Message to the Electrical Industry

BY R. H. BALLARD

(The most important message which has yet been given out by the newly elected president of the N. E. L. A. formulates the general plans of the association for the coming year—and opens up a vista of big things to be accomplished. The geographic section idea, a tentative program for committee work and a glimpse ahead to convention call for the support of every member of the entire national society.—The Editor)

One thing above all others we should earnestly endeavor to do is to carry the National Electric Light Association to the country. This will be very beneficial in inspiring real interest in Association affairs. I know from experience that an individual or company member situated at some distance from headquarters likes to hear from time to time from one or more of the officials of the Association, and hesitating to submit his matters unsolicited, if he does not hear something during the year, he feels that his section of the country has been overlooked. Let us carry to every section of the country the message of close harmony, cooperation and unity in the interest of service and of big things for the Association.

Geographic Sections.—The chairmen of our several national sections should also correspond quite freely with geographic sections and with the principal companies, where there are no sections, incidentally suggesting and urging the organization of more geographic sections. We should all of us urge in all quarters real earnest cooperation between manufacturers, jobbers, contractor-dealers and central stations. The geographic section is a wonderful vehicle for working this out to meet all local conditions.

Some of the state associations which are not affiliated with us as geographic sections are very insistent that the national convention should be rather in the form of a congress consisting of executives and regularly elected delegates from geographic sections, and Ohio, for instance, has said that on this basis they would be glad to affiliate with the national association. The state associations should not wait on the outside for this situation to come about, but if they earnestly think this is the best plan of annual procedure, they should join as geographic sections, and when a majority or two-thirds of the states of the Union are included in the geographic sections, it will be a simple matter for a decision to be reached as to the form the national meeting should take.

Company Sections.—Mr. Doherty's address at the company section meeting at Atlantic City, is worthy of serious study by us all. The possibilities along the lines Mr. Doherty suggests of large active company sections in which a certain amount of educational work will be going on at all times, including lectures, papers, etc., suggest a fine start for training men who might progress from company sections to geographic sections, and from geographic sections to national office.

Additional General Committees.—Among the big subjects which should be considered for the year and which would form a tentative basis for the convention later, are:

Electrification of Steam Railroads: This committee to handle the subject on a broad business basis. A committee of engineers to report on the purely technical features might be appointed by the technical session.

Regulation by State Commissions: This would involve a comparison of the methods used by the several state commissions in the country on such questions as valuation and the principles underlying rate of return.

Employees' Participation: The present status of welfare work and its good or bad effect upon employees, the question of employees' participation in surplus earnings, the question of employe stockholders, and the general question of labor should be handled by this committee.

Joint Technical Committee: A joint technical committee should be formed consisting of representatives from the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the National Electric Light Association, this committee to check up standardization and prevent conflicting ideas being adopted.

Los Angeles Convention: Let us all have in mind the advantages of holding another convention on the Pacific Coast, probably in Los Angeles. At all times let us keep boosting for the Pacific Coast Convention next year.

Committee Appointments —

Committees and chairmen thus far appointed and confirmed by the Executive Committee are as follows:

Public Policy Committee:
John A. Britton, San Francisco, Chairman
W. W. Freemen, Cincinnati, Vice-Chairman

Committee on Geographic Sections (New):
R. J. McClelland, Chief Engineer Electric Bond & Share Co., New York, Chairman
E. W. Lloyd, Commonwealth Edison Co., Chicago
L. D. Gibbs, Edison Electric Illuminating Company, Boston
Robt. Lindsay, Cleveland Electric Illuminating Company, Cleveland
J. E. Davidson, Nebraska Power Company, Omaha
H. E. Brandli, President, Mississippi Elec. Assn., Meridian, Miss.
O. H. Simonds, Dubuque Electric Co., Dubuque, Iowa
F. M. Tait, Past President, New York

Committtee on Company Sections:
Frank A. Birch, Chairman, Philadelphia Electric Company, Philadelphia, Pa.

Membership Committee:
Walter Neumiller, Chairman, New York Edison Co., New York

This committee reported on July 10, a total of 409 new members including 18 central station companies.

Rate Research Committee:
Alex Dow, Chairman, Detroit Edison Company, Detroit, Mich.

Finance Committee:
Jos. B. McCall, Chairman, Philadelphia Electric Co., Philadelphia, Pa.

Lamp Committee:
Frank W. Smith, Chairman, United Electric Light & Power Company, New York, N. Y.

Relations with Educational Institutions:
John F. Gilchrist, Chairman, Commonwealth Edison Co., Chicago, Ill.

Safety Rules:
Wm. C. L. Eglin, Chairman, Philadelphia

Accident Prevention:
C. B. Scott, Chairman, Bureau of Safety, Inc., Chicago

The Commercial Section, under Chairman John G. Learned, of Public Service Company of Northern Illinois, Chicago, has mapped out a comprehensive program for the year's work, with a large number of committees appointed directly by this section.

Technical and Hydroelectric Section, Chairman, I. E. Moultrop, Edison Electric Illuminating Company, Boston, has appointed committees for the year and is actively at work keeping big national subjects to the fore.

Accounting Section, R. W. Symes, Chairman, Detroit Edison Company, Detroit, Mich., has consolidated a number of committees and appointed some new ones for the year's work which will concentrate on standardization and on accounting relations with other associations and with state commissions.

Electric Vehicle Section, Geo. B. Foster, Commonwealth Edison Company, Chicago, is fully organized. Its transportation committee is conducting correspondenec with 155 colleges, with the idea of developing further transportation engineering courses, and is considering an advertising program, strongly endeavoring to awaken central station employes to the real value of electric vehicles.

Three and One-Half Years of Achievement

BY A. E. WISHON

(The primary issue of the N. E. L. A. at the present time may be expressed as the geographic section idea. The growth and reasons for success of the Pacific Coast Section are here forcefully set forth in the clearest exposition of the present situation we have been privileged to read. The statement comes from the newly elected President of the Pacific Coast Section N. E. L. A., the assistant general manager of the San Joaquin Light & Power Corporation. —The Editor)

Here are ten forceful accomplishments on the part of the Pacific Coast Section N. E. L. A., any one of which is of sufficient importance to justify the Geographic Section idea as a means for the upbuilding of the electrical industry of the nation.

THE GEOGRAPHIC SECTION IDEA IN THE WEST

1. Has established a geographic section of N. E. L. A. having by far the most intensive membership per capita of population existing anywhere in the Nation.

2. Made possible the establishment of an electrical cooperative campaign that has cemented all branches of the industry into one harmonious whole, which is today increasing the economic distribution of electrical supplies and aiding effectively in creating a better understanding between the public served and those having this duty to perform.

3. Paved the way to the interconnection of a vast system of power lines on a scale never before attempted in the history of engineering that brought about an economic and timely service during the period of war stress.

4. Had a part in alterations of the national safety code and amendments to local regulations that were necessary and vital to the effectiveness of public safety, and at the same time of economic importance to the electrical industry in the West.

5. Has accomplished the solution of many engineering and commercial problems, such as insulator and switch design and standardization, increasing fuel oil economy and perfecting methods of sales policy of vital importance to this section of the Nation.

6. Has brought together for the first time in the evolution of the electrical industry under one roof all branches of the industry for the study of problems of common concern.

7. Has worked out a plan for recommendation to the National Association whereby the section idea can play a more vital and helpful part in the future growth of the National Electric Light Association.

8. Has formulated a specific and definite plan whereby the public may in future be the better informed on the true status of affairs electrical and utility service in the district served.

9. Has taken preliminary and definite steps in aid of railway electrification by authorizing every possible cooperative assistance to engineering investigations of a similar nature now under way in the West.

10. Has assisted in ushering in a new era of utility service in the West, wherein a fuller realization has been brought about of the responsibility of service to the public and the joy of working to the practical establishment of this ideal.

The Geographical Idea

The Pacific Coast Section of N. E. L. A. was organized at Los Angeles, California, January 6, 1917. It comprises the states of California, Nevada, Arizona and New Mexico, which form a geographical unit possessing many problems in common.

The primary purpose of this section is to secure a better understanding of electrical problems peculiar to this territory, to better the industry as a whole, and above all to render the most efficient and economic service to the public at large.

To be more specific, let me quote from the constitution the full aims and objects of our organization:

> "The object of this Association shall be to foster and promote the common interests of its members and to advance scientific and practical knowledge in all matters relating to electric light and power companies. Also to establish cordial and beneficial relations with the public and kindred associations and between manufacturers of electrical machinery and appliances and the members of this Association."

Practically speaking the Pacific Coast Section was formed to get results—results that were not being obtained, but results that were necessary to the electrical industry of the Pacific Coast.

It was formed to save the N. E. L. A. from none too slow a death in these parts. This statement may appear undiplomatic—but such a state of affairs does not change the facts of the case which govern the writer, since facts are what we want.

Satisfactory Results

The constructive results obtained by this section are now matters of history in the electrical industry of the Pacific Coast—and when these results are compared to those obtained prior to the birth of our Geographic Section—no argument remains that can be advanced against the wisdom of our plan of organization.

As stated, the Pacific Coast Section was actually organized January 6, 1917. Four months later with R. H. Ballard, Vice-President of the Southern California Edison Company, (now President of N. E. L. A.) but then President of the Pacific Coast Section N. E. L. A. presiding, the first convention was held at Riverside, California. An intensive canvas of the four states California, Nevada, Arizona and New Mexico had been made, the message of "direct attention" had gone across and 1419 names appeared on the membership list—with 487 in convention attendance.

It was at this Riverside Convention that greater representation was given to Class "D" members (the master stroke of the section to date). It was here that the policy of creating a closer understanding between the four great branches of the industry—the Central Station, Manufacturer, Jobber and Contractor-Dealer—was definitely launched. From this convention dates a long line of down-to-the-minute results, and even that closer and more sympathetic understanding of the other fellow's problems—and at all times a closer cooperation of the four branches of the industry.

Cooperative Campaign Planned

It was here that the California Electrical Cooperative Campaign was created. A campaign

manned, managed and financed by the four branches of the industry—a campaign that continues to prove its original object:—

> —"Better electrical service to the public, and as certain results of that service, more profit to the individuals and companies engaged in serving the people of the commonwealth of California."

The California Electrical Cooperative Campaign is familiar to most of you, but just a few details: On this committee each branch of the industry is represented. Only $15,000.00 is subscribed from the total industry for its support—and yet from a dream of three years ago, from a single field representative at the start, today four field men are working and approximately sixty solicitors engaged under its direction. Cooperative newspaper advertising covering most of the state is handled through this organization; and hundreds of retail stores under its helpful influence have been improved. The different branches of the industry have a better understanding of one another—better business methods have been established and better business ethics.

What splendid cooperative action under such a plan as that of the Pacific Coast Section, N. E. L. A. makes possible, is today being recognized nationally.

H. F. Jackson, President of the Sierra & San Francisco Power Company, followed President Ballard as the second president of this section, and following President Jackson—Samuel Kahn, Vice-president and General Manager of the Western State Gas & Electric Company, was elected third president of the section. The good work so auspiciously inaugurated continued under both of these later administrations; the second convention, in spite of the stress due to war conditions, opened with 400 present, and the last convention at Coronado convened with 500 present.

During the last two years several "get together" electrical dinners have each year been held throughout the state, and it is not unusual to see 300 to 400 enthusiastic electrical men from all branches of the industry seated around the common table intent upon a common problem.

A Closer National Affiliation

This is not propaganda for secession. Today on the Pacific Coast as an active Geographic Section we are more closely bound to N. E. L. A. nationally than we were as inactive individual members several years ago. We have worked out results locally, we have seen what can be done by a flexible, workable, active body. We have become convinced of the absolute necessity of a National Association—a clearing house for national problems, and through which different Geographic Sections can have contact—but we are also convinced that the Geographic Section idea for handling local problems and bringing about local personal electrical contact is a national necessity, and that the National Association for our national problems must be made workable by being made more flexible.

ELECTRICITY FOR FARMERS

(The farm is one of the most recent and one of the most important additions to the ranks of large electrical consumers. The field is increasing steadily, and it has been estimated that there are now over 100 applications of electricity on the farm. The work of the University of California Extension Division, in keeping pace with new requirements along this line, finds an interesting illustration in a course in electricity planned expressly for farmers.—The Editor.)

The use of electricity in rural districts is becoming so universal that there is an ever increasing necessity for the farmer to have a working knowledge of its principles and applications. To meet this need the University of California Extension Division has instituted a course in electricity designed especially for farmers, and planned to cover the conditions created by varying facilities in different districts.

There are very few communities in the State of California where electricity is not available. People living in the valleys are supplied by numerous power companies who are constantly extending their power lines even to remote farming districts. Those living farther up in the foot-hills of the mountains often have streams close at hand which may be made to develop electricity by means of water-power.

Since electrical power is so generally available on account of the activity of large corporations, many who live in rural districts do not need to build plants of their own in order to have electric current. The cost of power, when purchased from a power company, is less than the cost of operating a gas engine driven plant, installed on the farm. However, those who are fortunate to have access to water-power have by far the cheapest means for obtaining electricity, since a water-power plant requires no fuel and very little attention if properly installed. For these reasons it is essential that the rural engineer should obtain a knowledge of the apparatus used in transmission systems, such as transformers, transmission lines, etc., in addition to familiarity with wiring and appliances and the general principles of the application of electricity.

In presenting the course in electricity for rural use the University Extension Division aims to restrict it to that part of electricity applicable to the needs of the man who wants to know how to wire his own home, connect up his own motors, install his own generating plant and do simple calculation so that he may become comparatively independent in the handling of electricity.

The course comprises fifteen assignments covered by a complete syllabus with diagrams and problems, and lessons in a text book. It is conducted on the correspondence plan.

The first three assignments include the simple laws of electricity and a few rules to memorize. The other assignments are devoted to a study of electrical machinery and the application of electricity to rural needs.

The aim is to make the course as practical and intensive as possible, and to cover only as much of general theory as is necessary for an adequate understanding of the subject from the farmer's point of view.

Cooperation as a Bankable Asset

BY C. W. BANTA

(A business talk from a banker which gives a glimpse of the new vision in business. Not only has cooperation been decided upon as the right thing within the industry itself, but it is recognized by the banks as the foundation of good business and the adoption of these principles is an asset to the man who would establish his credit. This is the first of a series of studies in cooperation which will appear from time to time in the Journal of Electricity under Mr. Banta's signature. The author is assistant cashier with the Wells Fargo National Bank and this page formed part of his remarkable address before the get-together dinner of the California Electrical Cooperative Campaign in San Francisco.—The Editor)

The other day I was handed the pamphlet,—"The California Electrical Cooperative Campaign, —Its Organization, Progress, Plans." I turned to the title page and read,—"An educational campaign in which the various electrical interests cooperate to improve the industry's service to the people of California." I found that the banking profession and the electrical industry have a mutual interest—service to the people of California.

The principles underlying the effort of each of us are the same. When we discuss them we speak in a familiar tongue, I am sure. You have caught the great ethical principles that lie behind your attempt to educate, to cooperate, to improve, to serve the people of California. You have, evidently, to an extent that I have never before witnessed, grasped the great truth that "he profits most who serves best." To make better business, you have entered a campaign to make business better.

But—how? How can this great good be accomplished?

> By dragging into the light of knowledge every unprofitable practice. And by setting up in the light, that "he who runs may read" —principles, ethics, and practices that lead to reasonable success and to business happiness.

If men realized that to expose their shortcomings to themselves and to those, who, in turn, depend upon them for success, would result in the elimination of loss, and disaster—what a stampede of conferences there would be! Retailer, jobber, contractor, banker,—each would be anxious to get facts that each needs most, from those who have most to give and who would be anxious to give. Credits, Purchasing, Manufacturing, Selling, Transportation, Finance—every phase of business would be exposed and faults corrected.

A great moral truth was once expressed:

> "For everyone that doeth evil hateth the light, neither cometh to the light lest his deeds should be reproved. But he that doeth truth cometh to the light that his deeds may be made manifest."

The same kind, if not the same grade of backwardness is today apparent in business; that is, some men are willing to cooperate for the good of all—and many are not.

Today, business men are freely giving of their confidential information to competitors—data that a few years ago would have been considered trade secrets and good-will. A competitor's ignorance, which heretofore has been considered a distinct advantage, has been discovered to be a real menace.

Recently at a small dinner party given by a friend to several business acquaintances, a story of a hunting adventure was forgotten at a most exciting point when one exclaimed—

"Tell us, is business becoming better or worse?"

Immediately, half a dozen questions exploded over the table.

> **One said —**
>
> "That is equivalent to saying, 'is the world getting better, or is it getting worse?'"
>
> **Another Offered—**
>
> "Is civilization an improvement, or a fungus growth on the face of the earth?"
>
> **Another—**
>
> "Is life a better thing than it used to be, or is it interesting only because it is complicated?"
>
> "What does 'Ethical'—'Moral'—'Good' imply? Is it a standard set up by the will or determination of the majority, or does some great universal law of compensation exist that the human race is striving to learn?"
>
> "Is there really such a thing as a Law of Compensation?"

That discussion started at about seven o'clock and was only ended at twelve—because we had to go home.

The story of business progress, I believe was fully developed.

First: There appears in the universe a physical law of compensation, so finely balanced that it holds a million suns and their worlds on scales. Men early learned and felt the laws of physical force. To the earliest savage, MIGHT was RIGHT. The first business deal was undoubtedly consummated through force generated by a stone hatchet. The Law of Compensation, as yet unknown to men, rebounded with as fierce a stroke as it had originally bounded and man learned the great principle that lies underneath the proverb that—

> "Whatsoever a man soweth, that shall he also reap."

Next: Man discovered that there was a great mental law of compensation—he discovered that knowledge is power—that "the pen is mightier than the sword" and that the man with a knowledge of conditions and values could acquire that which he otherwise would have to fight for. Still, injustice seemed to be as strong as justice. Knowledge could be used to bad purpose by evil men, great harm could be accomplished. King Solomon, in commenting upon his cogitations on this subject exclaimed,

> "My, how the wicked flourish!"

Gradually, there has come to be recognized as powerful, another great law of compensation—the Moral Law—that Right Is Might.

The cooperation in business that we see today is a result of appreciation of this law. It has been understood by the individual; it is commencing to be practiced on a larger scale by groups of men.

For a moment, compare these three mighty forces.

At first glance,—the Physical force. This appears to be the quickest in action and the most powerful.

On second thought—consider the power of **mind** over matter and it, in turn, appears the greater force.

Then again—the Moral force,—the force of facts; not mental dreams,—but truths. These mold physical forces to their purposes; they dominate all the knowledge of the Universe.

Today, we are witnessing a great change in the technique of conducting business. Business Morality, Right, Good Ethics, Clean Principles, Open Dealings, combined with expert knowledge and a physical ability to complete undertakings, are commencing to be felt to be the three essentials to a business success.

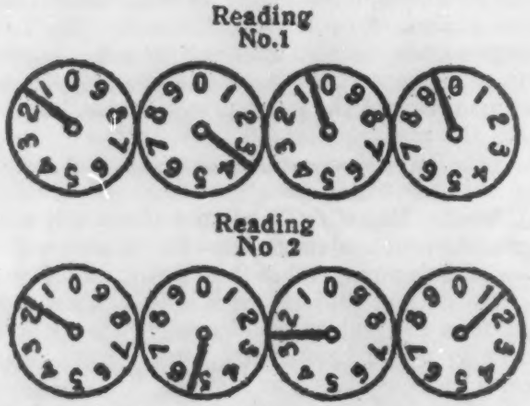
Success today can only be achieved through cooperation of its physical, mental and moral forces.

READING LIGHT METERS

(That public utility companies should educate their customers to read their own meters is the opinion of A. D. Church, district agent of the Midland Counties Public Service Corporation. It is not to the advantage of the distributors to have their customers regard the meter and the electric light bill as impenetrable and erratic mysteries, and the following article addressed to the company's customers which appeared in the Midland paper undoubtedly did much to promote good feeling toward the central station.—The Editor)

Most users of electric current seem to regard the meter with a feeling either of awe or apathy and often with distrust.

Good housekeepers who would not pay a milk bill without checking it up, do not think of reading the electric meter for themselves, or realize, that by taking a daily, or even weekly record, they can keep close tab on changing requirements and guard against repetitions of wasteful carelessness. The Midland Public Service Corporation, therefore, is urging all its consumers to keep their own record of consumption by regular reading of the meter, post it in a book and compare their figures against those of the company.



You will find that the average central station customer will feel safer and therefore like you better, if he can check your bills by reading his own meter.

Electric energy is measured in kilowatt hours. It is this unit that the meter registers and upon which service charges are based.

On the counter-face of the meter are four small dials, as shown above. The hand on the one on the left reads thousands, the next dial to the right, hundreds, the next tens, and the last one on the right, units. If it be remembered that the hand on each dial revolves in an opposite direction from that of its adjoining neighbor, the reading is extremely simple. Pictured above are the dial readings on two different occasions. Reading No. 1 being previous to reading No. 2, reading No. 1 has its pointers set in position to read 1309. The way to take this present reading is as follows:

The pointer on the first right hand dial points between 9 and 0. Write down the figure the pointer last passed which is 9. Then read the dial to the left. This pointer is between 0 and 1. Write down to the left of the figure you first wrote down, the last figure the dial passed which is 0. This gives 09. Then read the next dial to the left. This pointer is between 3 and 4. Write down 3 to the left of 09 and you have 309. Then read the next dial to the left. This pointer is between 1 and 2. Write down 1 to the left of 309 and you have 1309, which is the present reading of this meter.

To find out how much current has been consumed during a certain time whether it be a month, week, a day or a few hours, all you have to do is to read the meter at the beginning and at the end of the period, and subtract the first amount from the second. In the illustration above, reading No. 2 represents the later reading which is 1521. Subtract the smaller reading from the larger and the difference is the kilowatt hour consumption, in this case being 212 kilowatt hours.

To compute your bill the following rate schedule is applied: Ten (10) cents per kilowatt hour for the first sixty (60) kilowatt hours; five (5) cents per kilowatt hour for the next one hundred and fifty (150) kilowatt hours and three (3) cents per kilowatt hour for all in excess of two hundred and ten (210) kilowatt hours.

In explanation, take the meter reading illustrated above. The consumption is 212 kilowatt hours. The first 60 kilowatt hours cost 10 cents each or $6.00. The next 150 kilowatt hours cost 5 cents or $7.50. The third and last block or all in excess of 210 kilowatt hours costs 3 cents each or in this case 6 cents. The total bill is the sum of the three different blocks or divisions—$6.00 plus $7.50 plus $0.06 or $13.56.

Are you interested in the present possibilities of trade with Siberia?—living conditions and the electrical market in South America?—hydro-electric developments in New Zealand and Japan? Then watch out for the August 15th Foreign Trade Issue of the Journal of Electricity.

Channels of Distribution from Manufacturer to Consumer

BY SAMUEL ADAMS CHASE

(If you were to take a boat trip and there were several competing lines of steamships, the fare on all lines the same—and in one case you had the choice of a modern palatial steamer with a record for speed, safety and comfort, and in the other a second-rate boat having every evidence of decay, invariably getting into difficulties,—which of these two lines would you choose for your trip? Mr. Chase, in this address before the New York State Association of Electrical Contractors and Dealers, suggests how you can make your boat the one to carry the electrical trade.—The Editor.)

The channels of distribution in the electrical industry seem to be but indefinitely marked with trade beacons of—

Trade organizations
Proper trade differentials
Proper codes of practice and ethics.

In considering this subject three important factors should properly enter into the discussion, viz.: economic distribution, effective distribution, adequate distribution; the cargo to be considered is made up principally of merchandising or resale electrical appliances and supplies, and does not include lighting or power apparatus.

Samuel Adams Chase

The various channels of distribution in the past from the manufacturer to the consumer may be divided into the following groups:

The manufacturer direct
The jobber-wholesaler
The manufacturer's agent
The central station
The contractor-dealer
The hardware merchant
The dry goods store
The drug store

and in some instances by various other merchants not strictly in the electrical supply business.

The Place of the Middleman

The manufacturer has frequently made the mistake in the past of being allured by the temptation to obtain the middleman's profit and has taken small orders direct from the Consumer at an apparent profit; but he has learned by costly experience that this so-called profit is wiped out by the cost of obtaining and handling the orders and the result is not only a net loss in money but a disturbed and unhealthy condition in the trade. It has taken years of experience to teach some manufacturers the wisdom of a policy of selling their merchandising product to the consumer through the middleman, recognizing the service rendered by the Jobber and the Contractor-Dealer.

The manufacturer has, in some instances, chosen the direct route to consumers in the past on account of the uneconomic, ineffective and inadequate distribution through other channels and a hesitancy on the part of the middleman to create a sufficient demand for the goods manufactured. Although a definite sales policy has been adopted by some manufacturers of selling direct and through the middleman at the same prices, their direct sales exceed all others by a large percentage, notwithstanding the local influence of the middleman.

I will venture to state that the average manufacturer will welcome the day when it will be possible to economically and efficiently distribute his merchandising product exclusively through the Electrical Jobber and Retailer (Central Station and Contractor-Dealer); but these channels are not yet deep or broad enough or sufficiently safe and efficient to warrant any manufacturer with a large sales organization in the field selling exclusively through the Jobber and Retailer.

The Jobber

The Jobber or Wholesaler has done in the past, and in some instances still does a retail business in addition to a wholesale business, selling to other jobbers, to central stations, to Contractor-Dealers and to Consumers sometimes. I regret to state, he sells to Consumers without recognizing in the form of a differential, the service rendered by the Contractor-Dealer; in other words, sells to the Consumer at the Dealer's price, which practice is not only unethical but demoralizes the Contractor-Dealer business to such an extent that it makes that class in the industry seemingly distrustful. Quite naturally this has a tendency to prevent the Contractor-Dealer engaging in the retail business, hence retarding sales and expansion.

The Jobber of the past has been somewhat like many Manufacturer's Agents and has shipped an order calling for a miscellaneous lot of goods from the four corners of the earth direct from the various manufacturers to the Contractor-Dealer or Consumer because he does not carry a sufficient stock in his warehouse, thus causing delayed and expensive shipments. But the Jobber of today assembles all these goods in his own warehouse and distributes for the Manufacturer complete, in one shipment, which is of great advantage to the Contractor-Dealer. Therefore, the Jobber can be the natural, economic and efficient channel of distribution from the Manufacturer to the Contractor-Dealer.

The Manufacturer's Agent

The Manufacturer's Agent's policies vary. Some carry a small stock and ship and invoice customers, while others carry no stock and are simply order takers for the Manufacturer. Some sell indiscriminately to Jobbers, Contractor-Dealers, and Consumers, and should in reality be classed as salesmen for the Manufacturer, who has no sales organization in the field.

The Central Station

Central Stations have been pioneers in the sale of and distribution of incandescent lamps, and that

channel was marked with beacons of free renewals and cut prices, luring the industry to disaster.

Now the channel has shifted to the Jobber, Contractor-Dealer and Central Station, with the percentage going to each clearly marked with beacons of ethical merchandising and intensive selling, producing absolute fairness in competition between the competing groups. The Contractor-Dealer with a well-located attractive retail store now plays an important part in the channel of distribution of lamps from the manufacturer to the consumer.

The flatiron, washing machine and vacuum cleaner and other household appliances were introduced principally by the Central Station who did the pioneer work on these appliances as well as on incandescent lamps. It is my belief that the Central Station on account of its organization, prestige, financial responsibility and desire to add kilowatts to its lines, will always be the logical pioneer, and pilot the way for the Jobber and Contractor-Dealer on household current-consuming devices. It would be very unfortunate for the manufacturer and for the consumer if the Central Station should go out of the retail business conducted on an ethical basis, and most Central Stations will always carry the introductory or development expense of placing new current-consuming devices on the market.

The Hardware, Dry Goods and Drug Stores

The Hardware, Dry Goods, Drug Store, and other kindred merchants have probably done more to advertise electrical merchandising products than other distributors, but I do not always approve of the character of their advertising because, like former Central Station advertising, its principal story is "cut-prices."

Each of these groups, however, creates and obtains a certain amount of business which ordinarily could not be obtained by strictly electrical concerns, principally because these merchants make it easy for the housewife to obtain electrical appliances, their stores being attractive, located in the shopping district frequented by ladies, and in charge of an efficient sales organization. They will continue to increase their electrical departments and sales, and will attract the manufacturer as one of the most efficient and economic channels of distribution to the consumer, unless the Contractor-Dealer becomes alive to the situation and the necessities of the public, and parallels the methods of these merchants.

The beneficial results from a plan of scientific merchandising, practical trade cooperation and organization advocated by W. L. Goodwin, will unquestionably result in making the specialized electrical retailer, whether he be Central Station, Jobber, or Contractor-Dealer, the dominating channel of distribution from the manufacturer to the consumer.

The Contractor-Dealer

The Contractor-Dealer has not until recently become a merchant. All branches of the industry have tended to regard him as a necessary evil rather than an economic necessity. While classes in the industry have been cultivated to a high degree, the Contractor-Dealer until recently has been allowed to drift, unaided, uncultivated, and looked upon as a parasite. The Contractor-Dealer, because of these facts, and realizing there was no stability to the prices of merchandizing appliances or wiring devices, has not taken advantage of the opportunity presented and opened a sufficient number of attractive retail stores and the channel of distribution from the Manufacturer to the Consumer via the electrical dealer route has made it difficult rather than easy for the housewife to purchase electrical appliances.

The Open Meeting

The open meeting of the Contractor-Dealer is a necessity, and is commanding the respect of Manufacturers, Jobbers and Central Stations. I hope the time will come when every Contractor-Dealer will be a member and attend all State Conventions, and will include at these meetings representatives of Manufacturers, Jobbers, Central Stations, Architects, Engineers and the Press so that each can appreciate and understand the problems of the others.

The trade, like the flow of a river, seeks the channel of least resistance: the extent to which the Contractor-Dealer develops his business ability, the location and character of his store, the support which he gives to his trade associations, the manner in which he conducts his trade association, the character of the officers of his association, the conduct and manner of presentation of his trade problems through committees when dealing with the Manufacturer or Jobber, all tend to remove barriers from the Contractor-Dealer channel and direct the flow of trade.

Now, the Manufacturer is faced with the choice between certain channels for the distribution of his product: in one channel he has the palatial department store, well managed, with unquestionable credit standing; then he has the Central Station and the Jobber, and against this he has the Contractor-Dealer, who in the past has not always appealed to him in a favorable light as compared to the others. But with the methods they are now employing, attractive retail stores, located conveniently for the buying public, intensive sales methods, improvement in organization, proper presentation of problems through able committeemen — with all these presenting forcible rather than arbitrary arguments to attempt to force the flow of trade, the Contractor-Dealers are every day commanding a higher respect from Manufacturer, Jobber and Central Station, and are causing them all to think and to think hard. If they continue along these constructive lines, the result must be an increasing percentage of business flowing from the Manufacturer through the Jobber-Contractor-Dealer channel.

In conclusion I would suggest that in the channel of distribution in which the Contractor-Dealer navigates, the beacon be labeled

Organization
Cooperation
Ethical Merchandising Policies
Determination

With these slogans properly applied there can be but one answer and that is the Contractor-Dealer ship will be the flag ship and lead the squadron through the channel of distribution from the Manufacturer and Jobber to the Consumer.

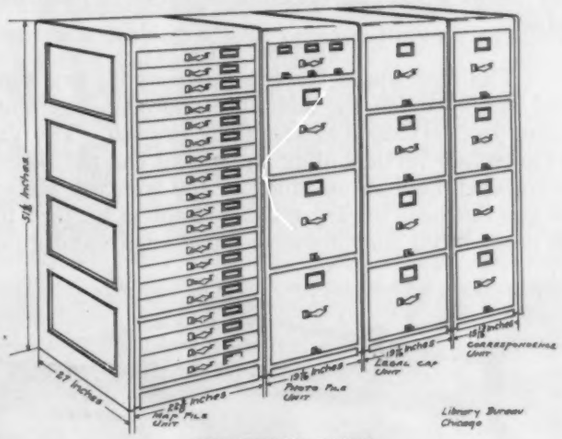
The Business Library

BY LOUISE B. KRAUSE

(In choosing the equipment for the business library, the first thing to do is to ask the advice of an expert. The question of shelving, of catalog files, and of the library room itself is here discussed from the vantage point of the experience of the librarian of H. M. Byllesby & Co., Chicago. The article is the ninth of a series on the business library which has been appearing in these columns. Attention is called to the necessity for written permission in reprinting the articles.—The Editor.)

MECHANICAL EQUIPMENT FOR THE BUSINESS LIBRARY

It is the purpose of this article to give an outline of the equipment required by the business library to adequately do its work. Some business men make the mistake of thinking that the mechanical equipment which they purchase will make a satisfactory library, while others put their faith in employing a librarian who they expect will create library service with the the expenditure of very little money for facilities and tools for carrying on the work.



THE FILING CASES

Only unit type filing cases should be considered, whether of wood or metal. As a rule wooden cases are more satisfactory both because of appearance and because they are less noisy.

Both opinions are wrong, for the business library needs adequate equipment with which to perform acceptable service quite as much as it does a skillful librarian.

Floor Space and Shelving

No business firm should consider establishing a library service unless it is willing to provide suitable space for it, for the best librarian in the country cannot give satisfactory service with books and material scattered in various places, wedged in tightly and stored on top shelves or in storerooms where there is not quick access to them.

The writer knows of several business firms, who from lack of sufficient library space store their periodicals, and as far as any real use is concerned they might as well not have them. Often the plea of lack of floor space is a superficial reason and only indicative of the fact that the firm is following a short sighted policy and has not really waked up to the tremendous value of having such material in order and readily accessible.

In selecting floor space for a business library a square or oblong portion of space without columns or jogs in the walls is preferable, as it permits of the most economical arrangement in putting in the required fixtures. Good daylight is of course most desirable but if this is not possible, care should be taken to have artificial light of high grade which can easily be provided by a system of indirect electric lighting supplemented by drop light wherever necessary.

The library floor space should be completely covered with cork carpet both for cleanliness and quiet, and it should be laid before any shelving is set, in order to avoid cuts and seams which catch dirt and also look bad if the carpet is laid after immovable fittings have been installed.

LIBRARY BUREAU UNIT DOUBLE FACED UNIT WOOD SHELVING

Such dust as does collect upon books on the open shelves is easily removed with a vacuum cleaner—and there is a great saving in space over covered shelves

In placing shelving for books, the most economical and compact arrangement is the stack plan, i.e., double faced bookcases set at right angles to a wall space and as close together as possible, but allowing ready access by narrow aisles not less than three feet wide between the tiers. The remaining wall space may be utilized by vertical files or wall shelving to supplement the capacity of the stack layout, but no business library of any considerable size

should be laid out on the plan of wall shelving only, as it is a most unnecessary waste of space.

The space assigned for the business library should be primarily selected to accomplish best the work the library is designed to do, and this principle is entirely compatible with a dignified and attractive library layout, if it is done by someone who has

LIBRARY BUREAU UNIT WOOD SHELVING

Not only are these shelves more compact and less expensive than unit type cases with glass doors, but the shelves are adjustable to the height of books.

both a knowledge of the work of the library and of the most approved library equipment.

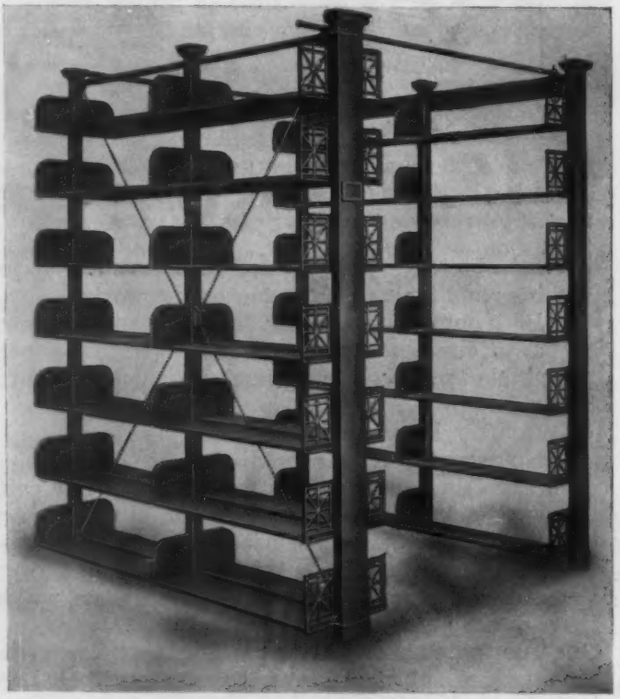
Shall the library stack be wood or metal, open or enclosed with glass, and shall it have fixed or adjustable book shelves? Open metal stack, 7 feet 6 inches in height, with 7 adjustable shelves, 3 feet long, eight or 10 inches wide, in each tier, or open wood stack of the unit type, 6 feet 10 inches high, with adjustable shelves are both suitable, with a preference for wood, because it ordinarily costs less and looks better in a small library room. Some business offices which have only a few books are using wood bookcase units with sliding glass doors. These answer the purpose for very small collections in private offices, but if there is to be any real growth they constitute too great an expense in proportion to the number of books shelved, and are not economical in saving floor space. Even when such wooden units are placed together in double stack form they are not comparable in economy with metal or open wood stack because they are less durable, hold a less number of books per shelf, can not safely be built up to as great a height and do not save space by having adjustable shelves for books of varying heights. Glass doors to bookcases in a live business library are a pest and the only service which they really perform in keeping out a little dust does not compensate for their added expense especially when dust can be readily removed from open shelves by the use of a vacuum cleaner.

The best method for a business firm to pursue in acquiring the most suitable and best arranged shelving for a library is to have their librarian ask one or two reputable firms making a specialty of library fittings to furnish drawings, descriptions and prices of their stack, and also make suggestions as to its best arrangement in a given floor space. The trained librarian who has been educated in the details of good and poor equipment and who knows what an adequate layout should be, will readily point out the merits and weaknesses of the specifications in regard to standardization, simplicity and price. It is always economical to equip even the smallest business library with a high grade standard make of shelving, which will never have to be discarded as the library grows, and which can always be matched when additional shelving needs to be purchased.

It must be remembered also that the business library is often not permanently located in a particular space because the layouts of all offices of business organizations are subject to change, due to growth in the business, and therefore library shelving which is well made, and of standard parts and which can be moved readily as occasion demands is most desirable.

Vertical Files

The floor space for the business library should not only provide for adequate shelving, but should allow for vertical files and their growth. The value of adequate vertical filing equipment can not be overestimated, because so much of the working material in the business library must be kept in vertical files. It is essential that drawers move easily and quietly



LIBRARY BUREAU ADJUSTABLE METAL SHELVING

The stack plan for double faced bookcases set at right angles to the wall is the most economical and compact arrangement for the business library

and do not get out of order, as this affords a great saving in labor as well as quick service for the busy man who wants the contents at his immediate disposal.

There are a large variety of makes of vertical files which are bewildering to the average purchaser in their rival claims for superiority. What the pur-

chaser needs as a guide is not a long list of all the makes of filing cabinets on the market but a brief comment on the kinds of cases which are worth while and the reasons why they are satisfactory.

In order to allow for growth, filing cabinets of the unit type only should be considered, as this type provides for expansion by the addition of new units, for flexibility, in that the units may be easily rearranged as new units are added, and for economy of space in that the greatest variety of drawers or files will occupy minimum floor space.

There are two kinds of unit filing cabinets, namely, the horizontal type in which cabinets are placed one on top of the other, with removable top, and the vertical type in which units are placed side by side, with detachable ends.

Excellent illustrations of the various useful combinations possible with both types may be found in the trade catalog of the Library Bureau, entitled "Unit Filing Cabinets in Wood."

The mechanical operation of all file drawers should be the best obtainable. Trays should be rigidly made and yet light enough to be easily handled. Vertical filing drawers should be mounted on roller bearing slides in order that they may run easily when loaded, for as one manufacturer states, "The efficiency of every card and filing system depends directly on the ease and precision of the mechanical operation."

If wood cabinets are selected, care should be taken that these are purchased from a manufacturer who will guarantee that the woods used are well seasoned and perfectly kiln-dried so that there will be no shrinking, swelling or warping. These are necessary qualifications which can not be assured when purchasing the lower priced cases on the market.

Wood cases are preferable to steel for library use, not only because of the appearance, but also because they are less noisy. Steel cabinets, despite the rubber protectors or buffers which do not wear for any length of time, are noisy. The fire resisting qualities are negligible as an argument for their use in the average business library.

Card Catalog Cabinets and Cards

All card cabinets for library use should be made for the standard centimeter size library catalog card which is approximately 3 by 5 inches and should be purchased with round rods to pass through the lower margin of the card, so that the cards can not be accidentally spilled out or carelessly removed and misplaced.

A good quality of card should be selected, for experience proves it is a waste of time and money to put permanent records on a poor grade of cards; guides with celluloid tips are more durable than bristle board ones.

The best cards on the market have both evenly cut edges and sufficient stiffness to permit rapid fingering and are made of durable stock. These points are particularly emphasized because one of the faults of many business offices is the buying of cheap card supplies without taking into consideration the reason why more expensive cards are really the most economical.

No matter by whom the equipment and supplies of a business organization are ordered, the business librarian should always have the privilege of specifying grades and makes if the best results are to be obtained. It is never advisable for the sake of general office uniformity to force supplies upon the business library which are not best suited for its work, and the librarian is always the best judge of the most suitable ones by reason of trained judgment, and experience.

A few well known firms dealing in library supplies are as follows:

Democrat Printing Co., (supplies) Madison, Wis.

Gaylord Brothers, (supplies) Syracuse, N. Y. This firm makes a variety of pamphlet binders which are used by many business libraries and are well worth investigating.

Library Bureau, (equipment and supplies) New York City, Chicago and branches in other cities.

Art Metal Construction Co., (equipment) Jamestown, N. Y. and branches in other cities.

Refer also to advertisers in the periodicals, "Library Journal" and "Public Libraries," which may be seen at the Public Library.

Editor's Note: The caption to the left hand cut appearing on page 75 of the July 15th issue should have read "Cutter book numbers" in place of "Dewey decimal system." These numbers are here applied to an alphabetical subject file.

ELECTRIFICATION OF STEAM RAILROADS

(The following tabulation is taken from the report of the Committee on Electricity of the American Railway Engineers' Association, as it was presented at the recent convention of the association.—The Editor.)

ELECTRIFIED RAILWAYS IN THE UNITED STATES

Line.	1917, miles electric track	Trolley voltage	Kind of service, passenger and freight	Power from	Kw-hr., 1917, at power house for trains	Reasons for not using water power
Pennsylvania R. R., New York	97	650 d.c.	Passenger	Coal	64,290,840	None available
Long Island R. R., New York	208	650 d.c.	Passenger	Coal	97,382,970	None available
Pennsylvania R. R., Philadelphia	95	11,000 a.c.	Passenger	Coal	23,100,360	None available
W. J. & Seashore	150	650 d.c.	Passenger	Coal	32,825,600	None available
Grand Trunk Ry.	12	3,300 a.c.	Pass. and F.	Coal	3,913,300	None available
Northern & Western Ry.	90	11,000 a.c.	Freight	Coal	56,651,700	Coal cheaper
New York Central	253	650 d.c.	Passenger	Coal	102,585,000	None available
N. Y., N. H. & H. R. R.	530	11,000 a.c.	Pass. and F.	Coal	90,500,000	Some water pr.
Michigan Central R. R., Detroit	25	650 d.c.	Passenger	Coal	7,431,000	None available
Hoosac Tunnel	21	11,000 a.c.	Pass. and F.	Both	7,727,000	
Baltimore & Ohio, Baltimore	8	650 d.c.	Pass. and F.	Water	6,200,230	
Chicago, Milwaukee & St. Paul R.R.	600	3,000 d.c.	Pass. and F.	Water	124,600,000	
B., A. & Pacific	90	2,400 d.c.	Freight	Water	23,408,270	
Erie (Rochester Division)	38	11,000 a.c.	Passenger	Water	1,894,860	
Great Northern	10	6,600 a.c.	Pass. and F.	Water	4,080,000	
Southern Pacific	138	1,200 d.c.	Passenger	Water	27,844,000	
Total	2,365				$75,000,000	

The Demands of Electrical Inspection

BY E. F. HENSLER

(The value of regular inspection of electrical installations and appliances in their relation to safety standards is not always fully appreciated by the various branches of the industry. A member of the City Department of Electricity, San Francisco, tells here some of the history and aims of the Inspection Department, and the problems which the electrical inspector encounters in the discharge of his duties. The material is from a paper read before the San Francisco Electrical Development League.—The Editor.)

In the early eighties, when the electrical contractor first became necessary to the industry, the electrical inspector was unknown. As the electrical industries increased, so did the number of contractors, and so also did the fire hazards, until the Fire Underwriters found it necessary to form some rules to check the increasing menace.

The Coming of the Electrical Inspector —

About 1890 or 1891, the late Geo. P. Low, the first electrical inspector for the Pacific Coast, entered upon his duties. At first there were no expressions of joy from the contractors—quite the contrary—but, as time went on, his efforts were appreciated more and more, and in 1893 the first set of codified rules was published.

Unfortunately the territory became too great for one man to cover, and while some installations received inspection the greater portion did not. The contractor was worse off than ever, and in most cases he had to come down to the level of the uninspected work. To make matters worse, about 1895, the Underwriters discontinued having an inspector for electrical installations only, leaving the contractors at the mercy of so-called electrical experts and inspectors. Under this regime there were occasions on which contractors who really had given the best that could be had at the time, found it necessary to ask protection of the Underwriters. That condition existed until 1901, when, as one of the provisions of the Charter of 1900, the Department of Electricity was created, and our municipal inspection became an established fact.

Inauguration of the Underwriters' Laboratories —

But there was another part of the industry that was experiencing trouble also — the manufacturer. Electrical appliances which would break down after being used a short time were placed on the market, and, as the hazards had been increasing on account of this condition the Underwriters again took a hand. In 1901 the Underwriters' Laboratories were incorporated—for service, not for profit—and testing laboratories were established in New York and Chicago, to standardize and test all electrical appliances.

The Chicago Electric Code —

Since 1905 the National Board of Fire Underwriters have published every two years the National Electrical Code Rules, for the installation of electric wiring and apparatus, and semi-annually, a list of appliances that have passed the standardized tests. In March, 1914, Ordinance No. 2582, for the provisions of which the Contractors' Association was largely responsible, became effective. The provisions of Section "E" are that appliances and the installations thereof must be according to the best known standard. What better standard can there be than the National Electrical Code, the rules of which are based on data gathered from all parts of the United States? San Francisco has no local testing laboratory, and if it had, it could not improve upon the laboratories in New York and Chicago, which have had eighteen years' experience, and the standards of which are recognized throughout the country.

The department has an up-to-date index of all electrical appliances which have passed the Laboratories' test, as well as of those from which their approval has been withdrawn for various reasons. These cards are issued when tests are completed, for the guidance of the inspectors, or of any one who may wish to avail himself of the information.

The Function of the Inspector —

When an installation is reported and an inspection is requested, what else can an inspector do, but note and report any portion of the installation that does not come up to the standard that has been set? Is he to be condemned for only obeying orders? It would be far better to commend his efforts in finding defects which might otherwise have escaped notice. It would be to the advantage of the contractor and the community as a whole to cooperate with the Chief of the Department and insist on better and more frequent inspections. The personal element must not and does not enter in.

Inspections in Moving Picture Theaters —

Largely through the efforts of the Inspection Department, the hazardous conditions that existed in the death-traps which were called operating rooms some ten years ago, have almost ceased to exist, but they still require inspection. About a year ago a systematized plan was devised for their reinspection, but, on account of increased calls for reported work, and the fact that the force of inspectors had been reduced, this plan had to be abandoned.

Insufficient Number of Inspectors —

In the budget for the fiscal year 1919-1920, notwithstanding the fact that the work reported has increased fully 75% since September, 1918, no increase has been provided in the number of inspectors. An interesting comparison is afforded by the following record for the months of September, 1918, and May, 1919:

Month.	Applications received.	Inspections made.	Approvals.	Left on file.	No. of Inspector days.	Avge. approvals, per Inspector day.	Avge. inspections per Inspector day.	Avge. inspections for each approval.
1918. Sept.	598	1416	659	1355	89½	7.07	15.81	2.14
1919. May	1014	1796	842	1500	117	7.19	15.23	2.12

The local department is unable to make any re-inspections of work installed except when its attention is called to existing hazards. In one case, on investigation, it was found that over 50 motors had been installed, totaling over 600 h.p., none of which had ever been reported or inspected. The installation proved to be extremely hazardous and is now being remodeled.

On still another occasion a little chance information gained from the representative of a firm caused an inspection, and the report stated that the same firm had installed five or six motors. A search of the records failed to disclose a report of any kind, and the entire installation will have to be remodeled. Who is to blame, the contractors or the inspector? On the other hand, there is hardly a contractor but has profited by these re-inspections.

MOTORS IN A WOODEN WARE PLANT

BY A. B. PRAENER

(The extensive use of electricity in manufacture involves a number of large and interesting installations. The following data from the Northwest describes in detail the equipment planned for a plant engaged in the manufacture of wooden ware.—The Editor)

An idea of the extent to which electricity is used in a modern wooden ware plant is to be gained from the following survey of the motors in use at the North Portland Box Company's plant at Portland, Oregon.

The following motors are all of the induction squirrel cage type. Motors are wound for 220 volts, 3 phase, 60 cycles. Starting compensators are furnished with all motors of over 5 h.p. and all compensators are provided with overload relays and no voltage release coils. All motors of 5 h.p. and under are provided with a fused oil switch similar to the Condit Electrical Mfg. Co's Type "I" oil starter.

Motor Driving Log Haul.—One 100 h.p., 600 r.p.m. motor without rails or pulley but with flexible coupling. One half of the coupling is keyed to the motor shaft, the other half bored 3-7/16 in. and keyseated.

Motor Driving Small Splitter.—One 20 h.p., 720 r.p.m. motor without rails or pulley but with flexible coupling. One half of the coupling is keyed to motor shaft, the other half bored and keyseated.

Motor Driving Block Conveyor.—One 7½ h.p., 1200 r.p.m. motor with rails and pulley. The pulley is 7 in. dia., 6 in. face.

Motor Driving Heading Saw.—One 20 h.p., 1800 r.p.m. motor without rails, pulley or flexible coupling.

Motor Driving Clipper Saw.—One 5 h.p., 1800 r.p.m. motor without rails, pulley or flexible coupling.

Motors Driving Stave Saws.—Three 15 h.p., 1200 r.p.m. motors with rails and pulleys. The pulleys are 21 in. dia. by 9 in. face.

Motor Driving Refuse Conveyor From Deck.—One 5 h.p., 1200 r.p.m. motor with rails and pulley. The pulley is 7 in. dia., 6 in. face.

Motor Driving Sawdust Conveyor From Deck.—One 3 h.p. 1800 r.p.m. motor with rails and pulley. The pulley is 5 in. dia., 5 in. face.

Motor Driving Refuse Conveyor to Hog.—One 10 h.p., 1200 r.p.m. motor with rails and pulley. The pulley is 8 in. dia., 7 in. face.

Motor Driving Sawdust Conveyor to Hog.—One 7½ h.p., 1200 r.p.m. motor with rails and pulley. The pulley is 7 in. dia., 6 in. face.

Motor Driving Hog.—One 75 h.p., 900 r.p.m. motor without rails or pulley but with flexible coupling. One half of coupling is keyed to motor shaft, the other half bored and keyseated.

Motor Driving Conveyor to Scow.—One 10 h.p., 1200 r.p.m. back geared motor without rails, pulley or flexible coupling.

Motors Driving Lathes.—Three 10 h.p., 600 r.p.m. motors without rails or pulleys but with flexible couplings. One half of the couplings keyed to motor shafts, the other half bored and keyseated.

Motor Driving Matcher.—One 5 h.p., 900 r.p.m. motor without rails or pulley but with flexible coupling. One half of the coupling is keyed to the motor shaft, the other half bored and keyseated.

Motor Driving Surfacer (Bottom Head).—One 15 h.p., 3600 r.p.m. motor without rails or pulley but with flexible coupling. One half of the coupling keyed to the motor shaft, the other half bored and keyseated.

Motor Driving Heading Turner.—One 10 h.p., 1200 r.p.m. motor with rails and pulley. The pulley is 9 in. dia., 6 in. face.

Motor Driving Middle Hoop Driver.—One 2 h.p., 900 r.p.m. back geared motor without rails or pulley but with flexible coupling. The motor has a 7 to 1 reduction to make the jack shaft run about 125 r.p.m. One half of the coupling is keyed to jack shaft of motor, the other half bored and keyseated.

Motor Driving Bottom Hoop Driver.—One 2 h.p., 1800 r.p.m. back geared motor without rails, pulley or flexible coupling. The motor has a 7 to 1 reduction.

Motor Driving Hog.—One 50 h.p., 1200 r.p.m. motor without rails or pulley but with flexible coupling. One half of the coupling is keyed to the motor shaft, the other half bored and keyseated.

Motor Driving Conveyor to Hog.—One 5 h.p., 1200 r.p.m. back geared motor without rails, pulley or flexible coupling.

Motor Driving Conveyor to Hog Conveyor.—One 2 h.p., 1200 r.p.m. motor without rails, pulley or flexible coupling.

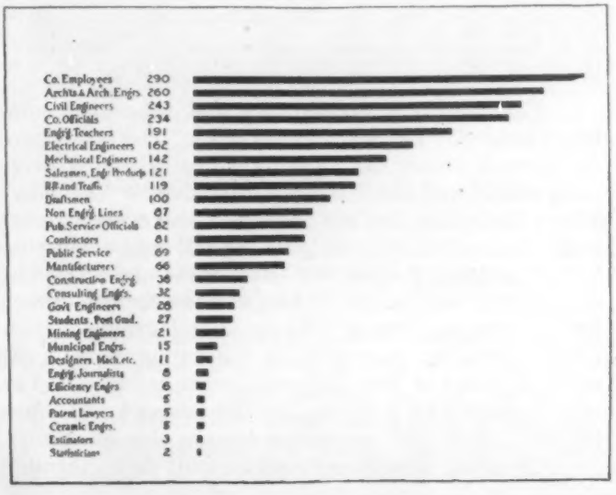
Total—434½ h.p.

Transformers.—There are three 100 kw. and three 125 kw. single phase, 60 cycle, oil insulated, self cooled transformers, wound for 2300 volt primaries and 220 volt secondaries. The transformers are complete with hanger irons and cut-outs.

Air Compressor.—There is one 20 cu. ft. portable air compressor complete with reservoir, drain cock, reservoir stop cock, hose coupling, air gauge, motor switch, fuse and fuse base, all mounted on a portable truck with piping complete. This is wound for 220 volts, 3 phase, 60 cycles.

WHAT BECOMES OF THE ENGINEER?

The following data on the occupations now being followed by the group of engineering graduates is compiled from the records of one of our largest engineering colleges. It is interesting to note that by far the largest group enter the employ of large companies, largely manufacturing and public utility enterprises.



PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(Do you know how to make a battery? Or how it is possible to determine how salty a solution is by a single electrical operation? The principles of electrolysis and of the electric battery here presented in the ninth leson of this series, will give you a clear conception of practices in every day application. The author is head of the technical division of the Extension Department of the University of California and this course is given in conjunction with extension work.—The Editor)

Fleet of electric trucks used in Portland, Oregon, by a department store. Each wagon is driven by a single motor connected to a nickel-iron storage battery. It is reported that the service is entirely satisfactory.

ELECTROLYSIS AND BATTERIES

The word **"Electrolysis"** is used to indicate the carrying of an electric current through a solution. It is found that absolutely pure water is an almost perfect insulator, but that the presence of an appreciable amount of any one of a number of substances makes the liquid a fairly good conductor. These soluble substances are called "electrolytes," and they include acids, salts, and "bases" (or alkalis). Sugar is not an electrolyte.

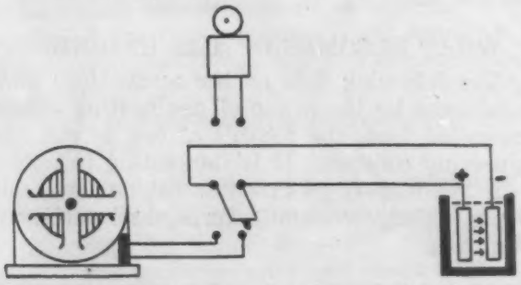


Fig. 1 The d.c. generator sends current through the liquid from the "anode" (marked "+"), to the "cathode" ("—") when the switch is down. If the plates are lead and the electrolyte sulphuric acid, a battery is thus produced, capable of ringing the bell when the switch is up.

The current is carried into and out of the solutions generally by metal "electrodes," the one where the current enters the liquid being called the positive or "anode," and the other the negative or "cathode." When the electrodes are far apart the current must pass through a long body of liquid, hence meeting high resistance; when the electrodes are large the conducting body of liquid has a cross section, which lowers the resistance. Hence in all kinds of batteries, including storage cells ("accumulators"), the effort is made to have the electrodes as large and as near together as possible, for the current must flow between them and resistance causes loss of energy.

Chemical Effects.—When current flows through a solution, as in Fig. 1 when the switch is closed, it tends to separate and release at the electrodes the components of the electrolyte. For example, sulphuric acid is a union of hydrogen with the "sulphate ion"; when current passes through dilute sulphuric acid the hydrogen is found to collect at the negative electrode and the sulphate is set free at the anode; being chemically active it immediately combines with water there, and liberates some oxygen. This gas may appear as bubbles upon the anode or it may

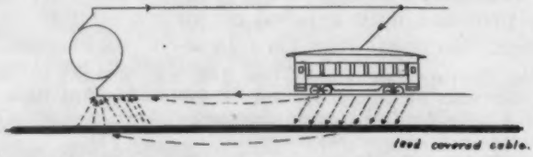


Fig. 2. Current returns to the generator by the rails and through the earth. Part of the earth current is diverted to the lead covered cable and electrolysis destroys the sheath.

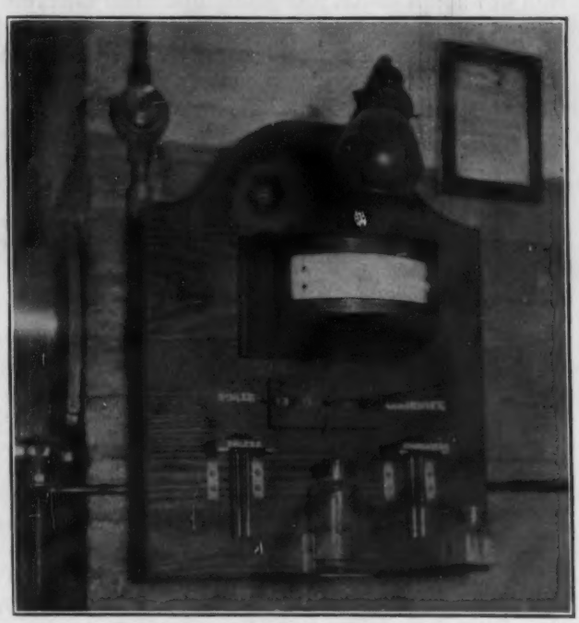
unite chemically with the material of the anode; the hydrogen at the cathode may appear as bubbles or combine chemically with the material of that electrode.

In weak solutions the resistance is practically proportional to the amount of electrolyte present. This fact is utilized ingeniously by certain California engineers who determine by a single test the salinity of water in their steam boilers. A pair of electrodes fixed at a certain distance apart are immersed in a sample of the water and connected to a known voltage through a mil-ammeter. A single reading thus determines the resistance, from which is known the number of grains of salt in a gallon of water. Then water which is too impure is blown out and fresh water substituted.

Moist earth carries current readily and makes trouble between electric railway companies and the people who own subterranean piping or metal cov-

ered cables. Where a current leaves a metallic conductor (which is, then, the anode) the metal is dissolved and removed.

Storage Batteries.—If two lead plates are used as electrodes in dilute sulphuric acid and a direct current sent through the solution, as in Fig. 1, it is noticed that the arrangement soon becomes a battery, capable of sending electricity through a wire, though it was **not** a battery before the "charging current" passed. This current changes the positive electrode to "lead peroxide" by giving oxygen to it,



Salinity tester used by the Pacific Gas & Electric Company. A bottle of boiler water is brought up around either pair of electrodes and the milammeter reads the current. The instrument is also calibrated to give a direct reading of the amount of salt present.

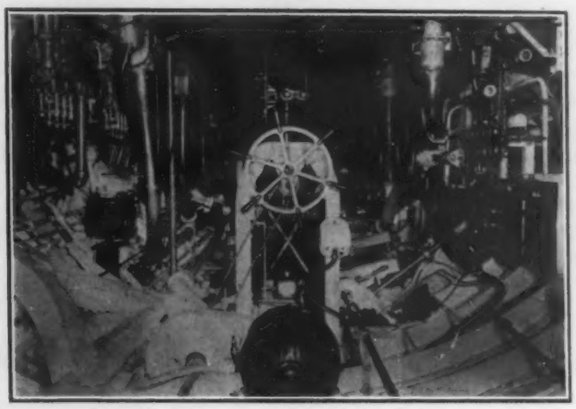
while the cathode remains lead. The chemical action of the acid upon the lead peroxide and the lead then causes an e.m.f. to be set up tending to send current out from the peroxide to the lead plate; the electrode by which the charging current entered the cell is the one by which current tends to go out when the cell is discharged by throwing the switch upward.

The chemical action during discharge is as follows: The hydrogen of the acid goes to the peroxide plate and takes off some of the oxygen, forming water, which dilutes the acid. The remaining oxygen of the peroxide plate is exchanged for sulphate ions, so that the plate becomes lead sulphate. Other sulphate ions go to the lead plate and combine with it, forming lead sulphate. So the sulphuric acid becomes weaker, losing hydrogen and sulphate ions; both plates become coated with lead sulphate.

Sending a charging current through again exactly reverses this action, taking sulphate ions off both plates and taking oxygen from the water to make the positive plate into lead peroxide. The sulphuric acid is increased in strength.

These lead storage cells are very widely used. They are built commercially with the active materials (spongy lead and lead peroxide) in grooves or holes upon a lead backing. One cell generally contains several positive plates similarly interconnected, the two kinds being interspaced and prevented from short-circuiting by wood and rubber separators. A number of these cells connected together form a "battery."

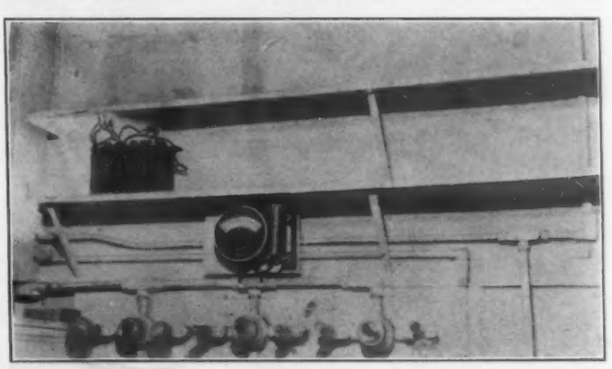
All cells of the same kind have equal voltage, the size and number of plates affecting only the resistance and the "capacity" of the cell—of course in a large cell there is more active material than in a



"Do It Electrically" is the motto aboard this submarine. Large storage batteries are charged by gas engines when the boat is on the surface and they supply power for propulsion, lights, cooking, and many other purposes when the boat is submerged.

small one, and it can give more ampere-hours before it is discharged.

The voltage of a battery equals the sum of the voltages of all the cells connected in series; if several cells are connected in parallel the pressure is no higher than that of one of them. The terminal voltage of a discharging battery is less than the generated voltage when current is flowing, just as in a generator. The current must pass through **resistance in the cells themselves,** and hence there is a



This small storage battery does the work of two shelf-fuls of dry cells. It is charged for a few minutes each hour by means of a clock operated connection to a d.c. circuit.

voltage drop, depending on the current and the resistance. Toward the end of the discharge the resistance increases, causing the terminal voltage to diminish rapidly. The volts per cell, when discharging, drop from about 2.1 to 1.8.

The Edison Storage Cell.—In order to overcome some of the undesirable features of the lead battery, such as weight, acid fumes, and the necessity for constant and skilled supervision, Edison invented the nickel-iron storage cell which has become popular for electric automobiles and many other uses. The

positive plate contains perforated tubes of nickel hydrate while the negative plate contains pockets of iron oxide. The electrolyte is a solution of caustic potash (chemically pure lye), which does not give off fumes. It is not changed in the processes of charging and discharging, which are chemically equivalent to transferring oxygen from one plate to the other.

The voltage of a single Edison cell is about 1.3, while the lead cell has about 2 volts. The pressure needed to charge an Edison cell is about 1.7 volts; to charge a lead cell, 2.3 volts. These figures are, of course, higher than the counter pressure generated in the cells, because the charging voltage has to overcome the voltage drop due to cell resistance as well as the voltage of the cell itself.

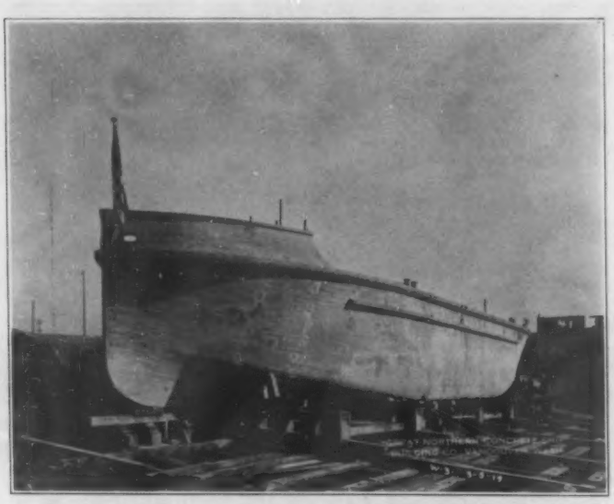
Primary Batteries.—Many batteries are in use in which the material of one plate is so changed and removed by the chemical reactions which cause current to flow that it cannot be restored by forcing current through the cell in the reverse direction. These are called "primary batteries" in distinction from accumulators which are sometimes called "secondary batteries." On account of its convenience and low resistance the "dry cell" is one type of primary battery very much used, and there are a number of different kinds of wet cell in use. To make a battery for experimental purposes one has only to put two pieces of metal of different kinds (or a piece of carbon and metal) into a solution of salt, an acid or an alkali. A dime and a copper cent separated by a piece of moist blotter will produce enough current to make a click in a telephone receiver. The action of such a battery depends upon the **difference** in the chemical action upon the two electrodes. Since any electrolyte acts differently upon every kind of solid conductor, any two metals (or carbon and one metal) will serve for a battery with any electrolyte. The voltage is different for every combination, varying from a very small value up to about 2 volts. The "dry cell" which has sal ammoniac for its electrolyte (mixed with some filler to a sort of paste and sealed into the cell with wax) generates a pressure of 1.5 volts.

Concrete Ships

BY J. W. SADLER

(The development of the concrete ship has done much to bring to the fore the question of electric drive for marine use. The greater weight of the concrete hull, and the consequent need for lighter equipment indicate that the concrete ship will be the electrically driven ship. The following interesting account of this latest phase of shipbuilding is from a paper recently presented in motion picture form before the Oregon Sections of the American Association of Electrical Engineers and the National Electric Light Association.—The Editor.)

The building of concrete ships may be termed a new art, and the principles and methods involved in their construction call for the cooperation and best efforts of the marine and structural engineers; the latter, of course, must be experts in concrete design.



A concrete ship ready to be launched at the Great Northern Shipbuilding Company's yards, Vancouver, B. C.

The Great Northern Concrete Shipbuilding Company, Vancouver, Washington, has under construction five concrete water tank boats for the Embarkation Service, Water Transport branch of the War Department. The boats are 100 feet long, 25 foot beam and 12 feet 6 inches depth of hold; the displacement is 500 tons. Three vessels have been launched and were ready for trial trips about May 25th. Concrete has been poured in the other two boats, which were launched about June first.

Design —

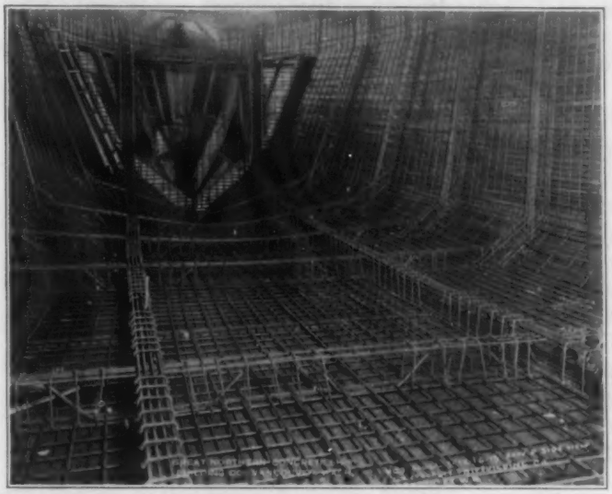
The design of a concrete hull is a most exact science, and differs materially from that of steel hull construction or that of reinforced concrete practice in building work. Concrete used in ship construction must, of course, be of higher grade than in ordinary work; higher unit stresses are permissible as the rich mixtures and high grade workmanship give ultimate crushing strength of 7000 to 9500 pounds per square inch at the age of six months. With concrete of this strength the unit stress adopted by the government on most of the concrete ships built is 1500 lbs. per square inch; however, the greatest unit stress used in designing the water carriers is 840 pounds. The unit stress for steel used is from 12,000 to 16,000 pounds per square inch; other unit stresses, such as shear and diagonal tension, etc., are considerably higher than that recommended by the joint committee; on account of the higher unit stress which is used, the ratio of modulus of elasticity is taken as 10 or 12.

In the design of a concrete ship we have the important problem of longitudinal strength, but in addition to that we must also study and design for transverse and local loads, as the fund of information and experience of many generations found in Lloyd's rules or other bureaus, pertaining to transverse framing and plating, cannot be applied in a concrete ship. The transverse frames are 8 in. by

10 in. in dimension and tankers are spaced 5 feet on centers. The bottom and side shell as well as the deck are 3½ in. thick. There are four transverse bulkheads 3½ in. thick with 8 in. by 8in. vertical stiffeners. A longitudinal bulkhead is placed at midship to divide the water compartments; all bulkheads are made with proper angle fillets or haunches.

Methods of Construction —

The bending and placing of steel is one of the intricate and difficult problems encountered in building concrete ships: with a wall only 3½ inches thick and three layers of steel, need for accurate bending and placing can be readily appreciated. Also the



The bending and placing of the steel is one of the most difficult problems of the construction. Structurally, however, the concrete ship is past the experimental stage and may be looked upon as a real rival to the steel ship.

curvature is constantly changing forward and aft, necessitating templates for each transverse frame. The centering of steel in the bottom and side slabs is done by the use of corrugated circular pre-cast concrete spacer blocks. All spacer blocks are placed within the transverse frame or beam area. The concrete blocks also help to give proper slab thickness.

In order to give any increase in the tare weight of the hull, which, of course, would decrease the cargo capacity of the boats, great care had to be exercised in building and staying the forms. The outside forms were placed first, consisting of 2 by 6 studs and shiplap lagging; precaution is taken to insure a smooth, impervious surface on the outside, and all forms are painted with form oil. The forms are all in place before concreting is commenced, except the inside sheeting between transverse frames, which is handled by placing gates 8 inches high operating in metal grooves at the transverse frames as the concreting progresses.

The concrete is mixed in a three-quarter yard mixer with side loader for charging. After being hoisted to the proper elevation it is carted by buggies over a platform running longitudinally over the center line of the boat. From this point it is run through short flexible chutes into mortar boxes, from where it is shoveled into place.

The element of mixing and placing the concrete did not give the trouble that was anticipated, and no great elaboration of plant is required; but the narrowness and general congestion of the form work made it difficult to place the concrete in the forms. In order that impervious and dense concrete might be obtained, electric hammers striking about 2000 blows per minute were employed. These vibrators perform almost incredible feats in leading the plastic concrete around the corners of the forms. The concrete was placed in one continuous operation,—except in the deck, which was generally poured from four to six days later.

The Future of the Concrete Ship —

The future for concrete ships is, of course, a matter of cost, and competition with steel ships rests on cost per ton of freight carried. The concrete ship has passed the experimental stage and is fast approaching a point where it will be a competitor of the steel ship. Structurally the problem is solved; improvements of course will be made but the fears which were entertained by many a year ago as to the serviceability of concrete ships have been largely overcome. The future for small craft, such as barges, lighters, tenders, etc., is bright and there seems to be an immediate field for that class of work. As to large ocean-going vessels, the experience gained in building smaller craft and the use of light weight aggregate, such as artificially burnt clay or crater formations found in various localities in this country, gives promise of making concrete a competitor of the steel ship.

The three hulls launched by the Great Northern Concrete Shipbuilding Company, Vancouver, Wash., were not treated with any water-proofing preparation; reliance was placed entirely on the rich dense mixture used. The vessels have now been in the water several months and the bilge pumps have never been turned over.

Electrical Equipment —

Power is provided by two 125 h.p. distillate engines for propelling the boat and one 25 h.p. distillate engine driving a pump.

Light is obtained from a 7½ kw., 125 volt, d.c. 2-wire generator direct connected to a distillate engine, together with a 56 cell Van Metre 20-hour storage battery. Also there is an auxiliary service on both sides of the hull, so that the boat can obtain service from an outside source when tied up at a dock, by simply plugging in on same. For controlling the system there is installed a slate switchboard, manufactured by the Western Electric Works, Portland, Oregon.

A complete system of American Bureau of Shipping's running lights are installed. Benjamin vapor proof fittings are used and Galvaduct conduct with General Electric Company's single conductor, stranded, rubber covered wire. The cargo lights are Benjamin Clusters. All plugs and receptacles are Russell and Stowell. There is installed a Tell Tail Board for the running lights. "Golden Glow," 250 watt d.c. searchlights are used. Jaggar-Sroufe Electric Company, Portland, Oregon, installed the complete electric system.

FUEL OIL AND STEAM ENGINEERING

(Economy in power plants where oil is used as fuel is a study that each day becomes of more timely importance due to the rising costs of this product and to the necessity for conservation of our national resources. Here are records in accomplishments of this nature, established in Arizona, that set new levels of attainment. The author is chief engineer of Chas. C. Moore & Co. Engineers of San Francisco. The paper was read before the recent Detroit Convention of the American Society of Mechanical Engineers.—The Editor)

A RECORD IN FUEL ECONOMY IN ARIZONA PLANTS

BY C. R. WEYMOUTH

In certain Arizona steam power plants the combination of favorable load factor and high fuel cost has not only necessitated but has also made possible the attainment of high fuel economy, and even in plants where cooling ponds are used for condensing purposes. This paper refers to the performance of three such power plants, namely, those of the Inspiration, Consolidated Copper Company, Inspiration Ariz.; the New Cornelia Copper Company, Ajo, Ariz.; and the Arizona Power Company, Clarkdale, Ariz. These plants embody many similar features. They differ, however, in methods of condensing as cooling ponds are used at the Inspiration and New Cornelia plants, and water from the Verde River at the Arizona Power Company's plant.

Plant Construction

The Inspiration plant was designed in the winter of 1913-1914. The International Smelting and Refining Company's smelter adjoins the Inspiration power-plant site, and the steam generated in waste-heat boilers in the smelter is utilized for the operation of the reciprocating blowing engines, which are designed for about 175 lb. steam pressure. These blowing engines are located in the same power-plant building as the steam turbines, and since the waste-boilers are connected to the same steam header as the oil-fired boilers, their steam pressure and the economy of the turbine plant have been limited by the common steam pressure of from 175 to 185 lb. The New Cornelia Copper Company's plant was designed in the winter of 1915-1916, and being independent of blowing engines, the boilers were selected for 250 lb. pressure. While a higher steam pressure would have been possible, the remote location of the plant and experience at the date of design led to the lower boiler pressure being selected. The Arizona Power Company's plant was designed in the winter of 1916-1917, and has boilers of 250 lb. pressure.

The Inspiration plant is 25-cycle, 3-phase, 6500 volts. The New Cornelia plant and the Arizona Power Company's plant are both 60-cycle 3-phase, 2300 volts. The maximum load at the Inspiration plant was estimated to be 12,000 kw.; three 6000-kw. Curtis turbines were therefore selected, thus giving one spare turbine. For the New Cornelia Copper Company's plant the load was estimated to be 7500 kw., and this led to the selection of two 7500-kw. turbines, one unit being a spare. The Arizona Power Company's plant was designed as an auxiliary to a hydroelectric system, and intended to carry a peak load of 5000 kw. Owing to the quick shipment required, however, a turbine previously ordered for another company, and rated at 6000 kw., was installed, whereas the remaining equipment was selected only for a 5000-kw. load.

Boiler Equipment

All three plants have Stirling steel-encased boilers, with Peabody-Hammel oil furnaces, Green fuel economizers, Moore automatic fuel-oil regulating systems, Wheeler surface condensers, Wheeler dry vacuum pumps, centrifugal hotwell pumps, direct-connected exciters, steam-driven boiler-feed pumps, etc. Superheaters are installed in all plants, specified to give 100 deg. superheat for the Inspiration plant and 150 deg. superheat for both the New Cornelia and the Arizona Power Company's plants, all measured at the boiler, and at normal rated capacity of boilers. All the plants also have centrifugal circulating pumps, the Inspiration pumps being turbine-driven, and the others motor-driven.

The nozzles for the cooling pond for the Inspiration Copper Company's plant were furnished by one of the spray-pond companies, who also proportioned and designed the pond arrangement. The actual vacuum shown by the operation of this plant, however has been a disappointment, as a pond of insufficient area was installed. Since the design of the Inspiration plant this detail has been corrected by the addition of cooling towers. The condensate is returned to the oil-fired boilers, and make-up water for the pond is purified by a Booth water softener. A cochrane hot-process purifier purifies the make-up for the oil-fired boilers installed at the smelter. The blowing engines operate at slightly lower vacuum than the turbines, and advantage is taken of this fact to heat slightly the turbine condensate by passing through the Volz heaters in the surface condensers of the blowing engines.

Cole-Bergman water weighers and Lea recorders are installed for feedwater measurement, for computing the steam supplied from the waste-heat boilers and the steam required by blowing engines, as well as the steam consumption of the turbines. Steam-flow meters are also used for checking purposes. By this means a separate record is kept of the economy of the turbine plant on the basis of operation dependent of the blowing engines.

The feedwater for the New Cornelia plant contains from 30 to 50 grains of impurities per U. S. gallon. The water is low in calcium sulphate and carbonate, high in sodium sulphate, and very high in sodium chloride. It is not practicable to purify this water by chemical treatment. The condensate

from the condensers is returned to the boilers, and raw make-up water is used for the pond and boiler-feed make-up purposes. Frequent blowing down is required for the cooling pond, as well as for the boilers. Scale is also formed both in the condensers and the boilers, and this requires frequent cleaning, as condenser scale tends to impair the vacuum.

The Arizona Power Company uses Verde River water for condensing purposes, this being taken through a flume at such a point that the pumping head is reduced by gravity flow. The condensate is returned to the boilers, and the raw make-up water is purified in a Cochrane hot-process purifier.

Economy of Inspiration Plant

Upon the completion of the Inspiration plant it was placed in regular serivce. The performance of the individual pieces of apparatus was investigated

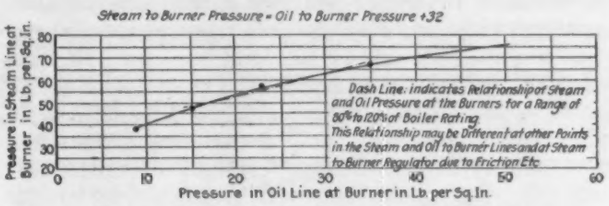

Steam to Burner Pressure = Oil to Burner Pressure +32
Pressure in Steam Line at Burner in Lb. per Sq. In.
Dash Line: Indicates Relationship of Steam and Oil Pressure at the Burners for a Range of 80% to 120% of Boiler Rating
This Relationship may be Different at other Points in the Steam and Oil to Burner Lines and at Steam to Burner Regulator due to Friction Etc
Pressure in Oil Line at Burner in Lb. per Sq. In.

Fig. 1. Steam and oil pressure at burner lines

in order to make certain that everything was working to the best advantage, particular attention being paid to the efficiency of boilers, the adjustment of burners, furnaces, and the automatic firing system. A number of uniform load tests were made of boilers for checking purposes, and the results obtained are given in Table 1 and the curves of Figs. 1 and 2. These tests show a fairly high efficiency at rating, and, rather contrary to the usual results obtained with non-casing-set boilers, a higher efficiency at fractional loads than at rating. The higher efficiency is due to the tightness and the insulating efficiency of the steel casing. As a result of these tests, instructions were given the operators to divide the load equally among all boilers, and this of course, was done automatically by the firing system. The operators, however, were instructed to keep as many boilers on the line at light loads as could properly be fired, maintaining a fire in each of the three burners per boiler; below this load boilers were cut off the line, and only refired when the load again increased.

The curves of Fig. 1 and 2 show the relation between the steam pressure of the atomizing steam and the oil pressure, both measured in the supply pipes at the individual burner, between the throttle valve and burner. From data obtained from these curves the steam-to-burner regulator was set to give the proper pressure of atomizing steam, based on the momentary oil pressure.

Under variable load the damper controller has been able to maintain CO_2 readings varying from 12 to 14.5 per cent CO_2, for which the corresponding excess air for normal conditions is 28 per cent and 6 per cent, respectively.

After instructing the operators, and while the plant was still under the control of the engineers, an average economy was obtained for the month of September 1915, as follows:

Average number of turbine units in operation	1
Average daily load, 24-hour basis, kw	5980
Average steam pressure at boilers, lb. per sq. in.	178
Average vacuum in condensers, in. of mercury, absolute	2. 66
Average ratings on boilers, per cent	95
Gross boiler efficiency, per cent	80.9
Average economy, kw-hr. per bbl. of oil as fired	289
Average economy B.t.u. per kw-hr.	21,500

In the subsequent operation of this plant by the owners the economy has been maintained practically equal to that shown under the direction of the engineers, but during the winter, due to colder circulating water, the economy is even better than indicated above. On the other hand, during the summer months, with the warmer circulating water and falling off in vacuum, the economy naturally drops to

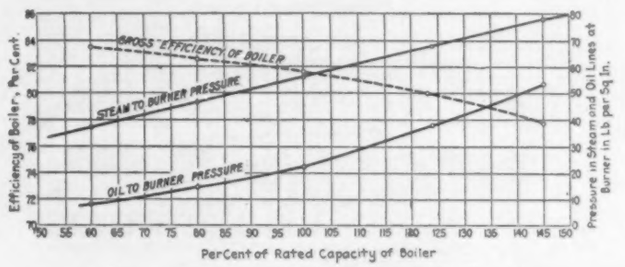

GROSS EFFICIENCY OF BOILER
STEAM TO BURNER PRESSURE
OIL TO BURNER PRESSURE
Efficiency of Boiler, Per Cent
Pressure in Steam and Oil Lines at Burner in Lb. per Sq. In.
Per Cent of Rated Capacity of Boiler

Fig. 2. Pressures and efficiencies at various loads

a lower figure than that given for the month of September.

This plant operates in conjunction with the hydroelectric plant at the Roosevelt Dam, and at periods of the year preference is given to hydroelectric power. As a result, there is a fractional load, or partial shutdown of the steam plant, and for certain months this in turn has naturally resulted in a reduced economy.

Operating Results

The operating results for the plant, furnished by Mr. W. W. Jourdin, Mem.Am.Soc.M.E., Chief Engineer of the Inspiration power-plant, are given by the curves of Fig. 3. It will be noted that the best monthly economy for winter conditions has been 294.5 kw-hr. per bbl. of oil, or 20,910 B.t.u. per kw-hr.; and the poorest economy for summer conditions for the normal load has been 257.5 kw-hr. per bbl. of oil, or 23,700 B.t.u. per kw-hr., although for the month of September 1917, due to the very light load, the economy was only 237 kw-hr. per bbl. or 25,970 B.t.u. per kw-hr. As previously stated, this plant, in comparison with non-cooling-pond plants, is subject to an accumulation of scale in the condensers, and as a result there is a slight loss in vacuum. Since purified feed-water is used, the plant is not subject to troubles from scale formation in the oil-fired boilers, nor does any loss of fuel result from shutting down boilers for cleaning or boiler blow-off.

The curves of Fig. 3 also give the operating records for combined boiler and economizer efficiency, atomizing steam deducted, this being the form in which the power-plant records are kept. A comparison of this result with the boiler efficiency tests would seem inconsistent without the explanation that the economizers at this plant heat the feedwater through a temperature range of from 40 deg. to 45

deg., whereas it will be noted that the results for the Arizona Power Company's economizers, given in Table 2, indicate a temperature rise in the economizer of 91 deg. fahr. In proportioning the Inspiration economizers with reference to the investment and fuel saving it was assumed that the average period of operation would be less than half the year, owing to the use of hydroelectric power; it was also as-

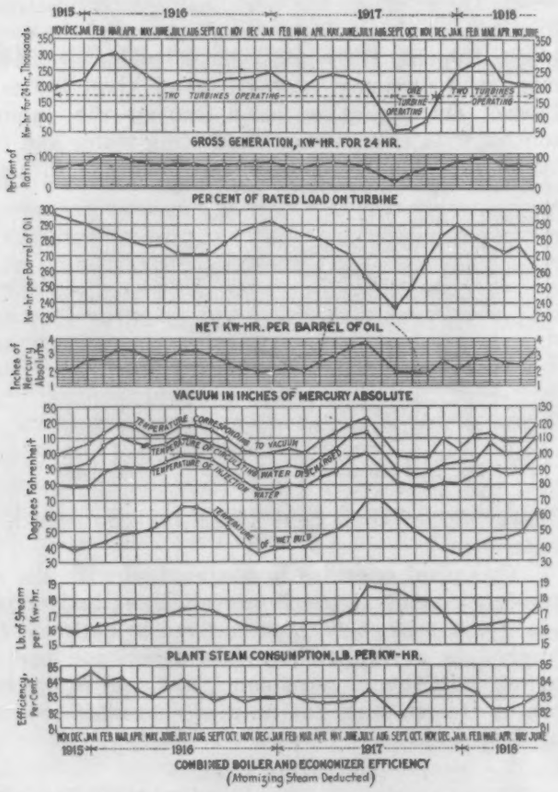


Fig. 3. Operating characteristics of the Inspiration Copper Plant

sumed that the fixed charges would be very high. This combination of circumstances, together with high freight rates and construction costs in Arizona, resulted in the selection of an economizer of comparatively small surface, giving a favorable return on the investment but a result considerably less favorable than that attained in the average economizer with oil fuel, when measured only by temperature rise.

Economy of the New Cornelia Plant

Following the installation of the New Cornelia plant in November 1917, an attempt was made by the designing engineers to check the economy of the station, but owing to the war and a scarcity of labor this work had to be abandoned before completion. While it has never been possible to show the best performance of which this plant is capable, the operating crew have, for the most part, been very efficient in handling it, except during an illness of the chief engineer, when the economy of the plant fell off to a disappointing figure. This occurred during the summer and fall of 1918, and the figures for economy for that period are thus hardly fair to the plant. It should also be borne in mind, in connection with performance data, that the feedwater condition at this plant is such that the frequent shutdowns for boiler cleaning and the large amount of hot water which is blown off from the boilers affect to an appreciable extent its economy.

Variations Due to Climate

This plant, due to its location in the southwestern portion of Arizona, is subject to more intense summer heat than is probably any other power-plant in the western territory, and this in turn gives rise to considerably less favorable cooling-pond and condenser performance, with respect to vacuum, for the summer months than for the winter months. The vacuum performance is also influenced by the accumulation of scale within the condensers between the periods of cleaning condensers, due to concentration of salts in the cooling-pond.

TABLE 1 RESULTS OF EFFICIENCY TESTS ON STIRLING WATER-TUBE BOILER IN INSPIRATION CONSOLIDATED COPPER COMPANY'S PLANT

Class M No. 26 battery Stirling water-tube boiler with steel casing. Heating surface per boiler, 7129 sq. ft. Rated boiler hp., 712.9 (based on 10 sq. ft. per hp.). Boiler-room floor elevation, 3615 ft. Normal barometer, 26.13 in.

		Test at 100 per cent rating [1]	Test at 80 per cent rating [2]	Test at 60 per cent rating [2]	Test at 125 per cent rating
Date of test, 1915		May 29	June 1	June 2	June 4
Number of test boiler in plant		5	5	5	5
Duration of test, hours		10	6	6	10
Temperature of feedwater entering boiler, deg. fahr.		210.15	200.0	191.0	209.5
Temperature of superheated steam, deg. fahr.		503.9	502.4	491.0	517.3
Deg. fahr. superheat		122.1	122.0	111.0	135.5
Temperature of steam to burner, deg. fahr.		504.2	502.7	..	..
Temperature of oil to burner, deg. fahr.		187.8	186.9	185.0	185.0
Temperature of flue gases, deg. fahr., measured across breeching outlet and in rotation	No. 1	466.5	423.7	389.0	495.0
	No. 2	469.0	427.5	394.0	502.0
	No. 3	470.1	434.7	389.0	507.5
	No. 4	473.3	434.7	394.0	508.0
	No. 5	472.5	432.5	391.0	507.5
	No. 6	470.8	429.0	390.0	510.5
	No. 7	471.3	427.0	392.0	506.0
Temperature of outside air, deg. fahr.		95.0	90.2	86.5	69.0
Temperature of air entering ashpit, deg. fahr.		93.1	100.3	95.0	75.9
Steam pressure, lb., gage		187.4	184.03	182.3	187.3
Pressure in oil line before burners, in lb., gage		22.0	15.0	9.+	36.8
Pressure in steam line to burner, lb., gage	Before burner valves	56.6	46.8	38.0	67.0
	After burner valves	..	..	..	..
Draft, inches of water	Top of first pass No. 1	0.014	+0.016	0.013	0.005
	Bottom of 2nd pass No. 2	0.062	0.080	0.032	+0.076
	Front of damper No. 3	0.076	0.070	0.020	+0.091
Draft, inches of water (power-plant instrument), front of Damper		0.065	0.074	0.033	0.110
Analysis of fuel oil by Smith Emery & Co.	Water, per cent (by centrifuge)	0.480	0.490	0.490	0.49
	Sand	Trace	Trace	Trace	Trace
	Sulphur in per cent of dry oil	1.06	1.06	1.06	1.06
	Carbon in per cent of dry oil	85.58	85.58	85.58	85.58
	Hydrogen in per cent of dry oil	12.87	12.87	12.87	12.87
	Net B.t.u. per lb. of oil as fired	18,540	18,540	18,540	18,540
	Sulphur corrected in B.t.u. per lb. oil	85	85	85	85
Total water actually evaporated, lb.		232,736	104,394	76,857	269,983
Lb. water actually evaporated per hour		23,273.6	17,399	12,809	26,996.3
Factor of evaporation		1.124	1.134	1.137	1.131
Total water evaporated from and at 212 deg. fahr., lb.		261,594	118,383	87,386	305,328
Lb. water evaporated from and at 212 deg. fahr. per hr.		26,159	19,730.5	14,564	30,532.8
Total oil fired, lb.		16,743	7,498.5	5,458.5	19,907
Oil fired per hour, lb.		1,674.3	1,249.7	909.5	1,990.7
Boiler horsepower developed		758	572	422	885
Per cent of rated capacity, based on work done by water-heating surface		106.7	80.3	59.2	124
Lb. water actually evaporated per lb. of oil		13.90	13.92	14.08	13.56
Lbs. water evaporated per lb. of oil from and at 212 deg. fahr.		15.62	15.73	16.00	15.34
Efficiency of boiler based on gross evaporation per cent.		81.76	82.64	83.74	80.29
Per cent CO_2 in flue gas at top of first pass		15.5	15.17	15.1	15.1
Percentage analysis of gases at bottom of second pass	CO_2	15.6	15.41	15.0	14.4
	O	0.8	1.11	1.4	1.94
	CO	Trace	0	0	0
	N	83.6	83.48	83.6	83.66
Percentage analysis of gases at front of damper	CO_2	14.5	.	14.5	14.3
	O	2.3	..	2.1	2.11
	CO	Trace	.	0	0
	N	83.2	..	83.4	83.59
Per cent excess air over chemical requirements at front of damper		4.19	..	4.19	6.14

[1] Apparent discrepancy in the draft readings of power-plant instrument and thermometers are due to the different location of the nozzles and to slight leaks in flue-gas piping.

[2] On account of the waste-heat boilers and intermittent firing of the other boilers the load was very jerky. On this account the damper was fixed to a low point on the draft and the ashpit door was regulated during the test.

The best economy for this station, known to the writer, is for the month of January 1918, the average performance for four successive days being as follows:

Date 1918	Average Load, kw.	Economy, kw-hr. per bbl. of oil	B.t.u. per kw-hr.
Jan. 26	7921	321.7	18,975
Jan. 27	7830	324.1	18,833
Jan. 28	7725	324.2	18,829
Jan. 29	7800	326.2	18,711

The poorest economy for this station during the summer of 1917 was for the month of July, namely 293.5 kw-hr. per bbl. The average vacuum was 1.66 in. absolute and the average load 5550 kw. The poorest economy during the summer of 1918 was also for the month of July, or 287.5 kw-hr. per bbl. The average vacuum was 2.14 in. absolute, the average load 5850 kw., and consequently the economy for the summer of 1918 was abnormally low.

The monthly report for December 1918, gives the following: Average load, 7800 kw.; average economy, 312 kw. per bbl. and 19,913 B.t.u. per kw-hr. The monthly report for January 1919, gives: average load, 7790 kw.; average economy, 317.9 kw. per bbl., and 19,535 B.t.u. per kw-hr. The improvement for the month of January over December is due to a straightening out of the aforementioned difficulties experienced in the summer of 1918, and it is the writer's belief that the station will soon be operating at its best previous economy for the corresponding season.

It will be noted that the economy for the New Cornelia plant is materially better than that of the Inspiration. This is due somewhat to the larger turbine units installed, but in the main to the higher steam pressure and to the improved design of cooling pond, which results in better vacuum. In comparing the economy of these cooling-pond stations with that obtained in tidewater plants, allowance should be made for the size of turbine units, the obtainable vacua under operating conditions, the increased head on circulating pump due to the greater quantity of water which must be handled through the condensers, and the increased pumping head due to the cooling-pond nozzles and longer lengths of circulating-water line.

Economy of the Arizona Copper Company's Plant

This plant was completed in September 1917, and due to the war conditions in the mining region it was difficult to assemble a skilled operating crew. The plant was furnished under a contract covering a complete plant-economy guarantee at 5000-kw. load, and the final test, covering 48 hours' operation in regular commercial service, under variable load, was concerned mostly with the economy at this load, although a run was made at 6000-kw. load, which is the rated capacity of the turbine. The results for the final test are given in Table 2. At all times during this test the plant was subject to a variable load, due to the regulation of the hydroelectric system. The oil was carefully weighed and the electrical output was measured by calibrated meters. The electrical output given is the net useful output for the station at the 2300-volt bus, deduction having been made for the power consumption of electric auxiliaries, including lighting for the operators' cottages, circulating water pump, deep-well pump and air washer. The average electric auxiliary load was 46 kw., which is somewhat smaller than would have been the case had the entire head on the circulating water been overcome by pumping; against this condition is the fact that during the test the quantity of circulating water was somewhat less than specified, so that roughly speaking, the one condition nearly offsets the other.

TABLE 2. RESULTS OF TEST OF THE ARIZONA POWER COMPANY'S STEAM PLANT AT TAPCO, ARIZONA

Temp. of flue gases leaving economizer No. 3, deg. fahr.	276
Duration of test, hours	6
Boiler pressure, lb. per sq. in. gage	250
Steam pressure at turbine throttle, lb. per sq. in., gage	238.5
Avg. temp. of superheated steam at boilers, deg. fahr.	546
Temp. of superheated steam at turbine, deg. fahr.	516
Temp. of feedwater entering boilers, deg. fahr.	207
Temp. of water leaving feedwater heater, deg. fahr.	116
Temp. of circulating water from condenser, deg. fahr.	62.4
Temp. of circulating water to condenser, deg. fahr.	45.7
Room temperature, deg. fahr.	83.2
Barometer, inches of mercury	26.773
Vacuum in condenser, inches of mercury	25.783
Absolute vacuum, inches of mercury	0.990
Average load, kw. per hr.	5,815
Power factor by power-plant indicator	0.93
Electrical Output by Integrating Meters:	
Gross kw. generated	34,890
Gross kw.-hr.	5,815
Auxiliary power, kw.	277
Net kw. output	34,613
Net kw-hr. output	5,769
Oil Measurements:	
Total oil weighed, lb.	34,516
Correction due to diff. in temp. at start and finish, lb.	46
Oil actually used, lb.	34,470
Avg. grav. of oil (analyzed by Smith Emery & Co.), deg. B.	17.65
Weight of oil per bbl. of 42 gal., lb.	332
Heat value of oil (analyzed by Smith Emery & Co.), B.t.u. per lb.	18,703
Economy:	
Fuel used per gross kw-hr., lb.	0.988
Fuel used per net kw-hr., lb.	0.996
Kw-hr. per bbl. of oil, gross	336.0
Kw-hr. per bbl. of oil, net	333.3
B.t.u. per kw-hr., gross	18,478
B.t.u. per kw-hr. net	18,628

Operating Results

It is not possible to give daily operating results for this plant, at the load for which it was designed, for since its installation it has been maintained only for reserve purposes, carrying occasional peaks but the majority of the time a very light load, and for a number of hours during an average day, with the turbine at standstill. Of course, favorable economy is not possible under such conditions, as the fuel losses due to keeping hot boilers, piping, etc., the dead-load losses for the operation of auxiliaries, and the zero-load steam consumption of turbine result in a zero-load fuel consumption of the plant which is an appreciable percentage of the full-load fuel consumption. With the foregoing explanation, the results given below for the month of February 1918, are as follows:

Total kw-hr.	1,235,580
Total bbl. of fuel oil used	4,783.9
Total hours of operation	444
Average kw. for operating period	2,800
Kw-hr. per bbl. of oil (delivered to lines, net)	258.50
Operating period load factor	0.467
Average kw. for monthly period	1,838
Monthly period load factor	0.306

It is of interest to note that the turbine at the Arizona Power Company's plant is practically a duplicate of those at the Inspiration Copper Company's plant, having the same number of stages, the difference in the operating economy of the turbines being

largely due to steam pressure. Here, again is a marked increase in plant economy due to an increase in steam pressure, and also by reason of the colder river water at the Arizona Power Company's plant as compared with the cooling-pond water at the Inspiration plant and the consequent improvement in vacuum. All economy figures given for these plants are based on oil as fired, without deduction or correction for moisture, sulphur or silt.

The engineers have endeavored to instill in the minds of the operators of these plants and to show by example that high economies need not merely be looked for during the test period, but can be maintained during the operating period. The Inspiration plant is large enough to permit the employment of a boiler-room engineer, but, due to their smaller size, such an engineer is not maintained at the other two plants. This plant was designed on the assumption that the average load would be maintained for a period of six months only during the year, and that oil delivered would cost $1.45 per bbl. The New Cornelia plant was designed on the assumption that oil would cost $1.25 per bbl., but since the date of design of these plants the cost of oil has materially increased.

Personnel

The selection of the principal equipment for the Inspiration plant and its general layout were made jointly by John Langton, Consulting Engineer for the Inspiration Consolidated Copper Company, and Chas. C. Moore and Co. Engineers, which firm was also responsible for the detailed designs, installation and tuning up of the plant.

For the New Cornelia plant the entire work was in the hands of Chas. C. Moore and Co. Engineers, with the approval of A. G. McGregor, Consulting Engineer for the New Cornelia Copper Company.

The Arizona Copper Company's plant was designed and built by Chas. C. Moore and Co. Engineers, with the approval of R. S. Masson, Chief Engineer for the Arizona Power Company.

A considerable portion of the testing work on the Inspiration plant was handled by A. G. Budge, under the writer's direction, and for the New Cornelia and Arizona Power Company plants by T. B. Paulson, also under the writer's direction.

A NEW FUEL

BY H. E. LINDEN

(Fuel developments which tend to the conservation of natural resources, and which permit of the more effective use of local products, are of especial interest to the Pacific Coast where the coal is of poor grade. Such a development is the "colloidal fuel" described below. The material formed part of a discussion on California pulverized coal, and the author is of the Beckman and Linden Engineering Corporation of San Francisco.—The Editor.)

Announcement that has recently been made by the Submarine Defense Association of 141 Broadway, New York, of which Lindon W. Bates is the chairman of the Engineering Committee, pertains to the development of what is known as colloidal fuel.

This colloidal fuel consists of a liquid fuel with about 45% fuel oil, 20% tar and 35% pulverized coal, or it may also contain 75% of pulverized coal and 25% of fuel oil, eliminating the tar. Such colloidal fuel as this has actually given merchant vessels or warships upon a given tank capacity, a 20% increased steaming radius over that possible with the usual fuel oils. A medium was discovered which would neutralize gravitation and keep the introduced heavier particles of carbon from settling. This new agent is a paste-like, greasy substance, called "fixateur." Twenty pounds of it in one ton of liquid fuel keeps the powdered coal and tar suspended in the oil and evenly distributed. Coals containing 25% of ash have been used for this purpose without any difficulty. The following is a description of the method of producing and handling this fuel, employed by the Brooklyn plant of the Standard Oil Company.

Fuel-Making Apparatus —

Adjoining the boiler room in an open area 60 feet square is the apparatus for making the colloidal fuel. It consists of a simple crusher for breaking up the coal in a dry state into a fineness sufficient for its passage through a 200 mesh screen. The fixateur is a heavy, black pasty substance of the consistency of axle grease and is the apparently magic substance which holds the coal particles suspended and equalizes the different specific gravities that go into the mixture.

The fixateur, to the amount of 1 per cent of the finished product, is placed on the top screen of four horizontal screens which extend through the entire diameter of a tank, about 20 ft. high and 12 ft. diam. The oil is entered through the top of the tank and seeps through the fixateur. The lower screens catch that part of it which oozes through the first screen, thereby holding it up where more oil can encompass it. When the oil has thus been fixated, it is introduced by pumps into the mill, which is a cylindrical tank about 2 ft. high and 3 ft. in diam., inside of which are the mixers, consisting of arms with balls upon the ends. After the fixated oil and coal dust have been thoroughly compounded, the new mixture is pumped into storage tanks, ready to be forced into the burners.

Facilities in California —

It seems that a fuel of this kind would be ideal for development in California. A by-product distillation plant could be installed at one of the coal mines which would furnish the necessary tar and in addition coke briquettes of the carbo coal variety which, if found more useful due to their high carbon content, could be used in the powdered form to be put in the colloidal fuel instead of the crude coal itself. There is reason for believing that the California coal fields will become more valuable and that this coal should by all means be substituted for fuel oil wherever possible.

Growing Demands Upon Fuel —

For our newly-created merchant marine we shall need about 32,000,000 barrels of fuel oil in the ensuing year, and our fighting fleet will consume in that time a round 4,000,000 barrels. These are merely straws which show the trend of the current of consumption. Quite half of all the petroleum mined in this country is used for steam raising, and there are parts of the United States today wholly dependent upon liquid fuel. Crude oil and petroleum derivatives are indispensable to our industrial progress and to our many other manifold activities.

Load and Diversity Factors in Retail Merchandising

BY J. E. BULLARD

(That profits in the retail business are in proportion to the rapidity of turnover of stock, and that rapid turnover should be worked for even to the extent of selling off goods at cost, are contentions which are of vital interest to the contractor-dealer. Variety in a small stock, rather than a large stock of any one article, is advocated as tending to keep up rapid turnover.—The Editor.)

Due to the fact that the operating expenses were very low a great many people gained the idea, and some still believe, that there are wonderful profits in water power developments. In practice, however, these great returns on the money invested are never realized to the full and are often not enough to pay an immediate return on the fixed charges.

Load Factor and Maximum Capacity —

This is due to the load factor. It all depends on how uniform the load on the plant can be made and how nearly the average load approaches the maximum capacity of the plant. In actual practice this is not as high as might have been expected. It is only after years of business development that the load factor can be made to approach 100 per cent.

It is the amount of current sold rather than the rate at which it is sold that determines the annual revenue, and it is a high load factor that makes the maximum sales of current possible. It is not what it costs to build and operate a plant that counts so much as it is the amount of money that the investment can be made to earn, and all this depends upon the load factor.

Some central stations have found that it paid to go so far as to reduce rates to a point which would make possible the securing of business that was out of reach at the old rates. The increased business, the higher load factor, more than made up the loss in revenue.

The Load Factor Principle in the Sale of Appliances —

In the selling of appliances the load factor principle holds as true as it does in the generating and the selling of electricity. No merchant can hope to make the greatest profits unless he can make his capital invested result in the maximum return in sales. To do this he must keep his rate of turnover as high as it is possible to keep it. A 100 per cent load factor on a central station means that the plant is constantly sending out current at the full capacity of the plant. A 100 per cent of turnover in the merchandising field means that the merchandise is constantly flowing through the store at the maximum rate and that there is never any more in stock than is absolutely necessary to render satisfactory service to the customers.

There are small stores in our large cities that closely approach this ideal condition, just as there are some central stations in the country which are more and more closely approaching the ideal. These small stores carry only enough stock to last them a very few days. They have fresh stock delivered to them every day, and since in most cases they do not pay for the stock upon its delivery they have sold it and collected the money for it before they have to pay for it. Accordingly they are doing business on the capital of the wholesaler. In order to do this, however, they have to turn their stock something like a hundred times every year. It is hardly necessary to state that these stores are making money and that they are making money because they are turning their stock so frequently.

Turnover and Profits —

Just what making frequent and complete stock turnovers means is best illustrated by taking an example.

Suppose a man invests $10,000 in electrical supplies and utensils, that he sells this stock in the course of a year and that he averages 35 per cent margin. By the end of the year for paying interest on the capital invested, meeting the rest of the overhead and operating expenses and yielding a profit he will have realized the following: since the 35 per cent is figured on the selling price, $10,000 represents 65 per cent of the sales. This makes the annual sales $15,384.61, which leaves $5,384.61 for meeting all expenses and leaving a profit. Since $10,000 has been invested in stock we will deduct 6 per cent on this sum, or $600. This leaves $4,784 that has been earned by the $10,000 invested in the stock.

Now suppose that another man invests only $2,500 in stock, that he carries as good a stock as the man who has invested $10,000 and that by turning over his stock four times in a year he is able to equal in annual sales that of the other man. His sales and his margin being the same, he will have a gross of $5,384.61 with which to meet all expenses and provide a profit. Since, however, he has invested but $2,500 in stock the interest on this capital amounts to only $150, leaving a balance on the margin of $5,234.61, or $450 more than the man who turned his stock but once.

Selling Off Stock —

Setting a time limit on all stock carried also helps, just as the readiness-to-serve rate of the central station helps to increase the load factor. It does not pay to carry seasonable goods over from one season to another. It pays better to turn them into money even though they have to be sold at cost or less and use this money to buy stock that will sell. The most successful business men do follow this practice. The shoe business is an example of this. Many styles of shoes carried by the average shoe dealer are seasonable in nature. The prosperous dealer is the one who closes out his stock of seasonable shoes at the end of each season. The desire to do this on the part of shoe dealers has given rise to many different methods of getting rid of them. From the dealer's point of view the important thing is that the shoes are disposed of.

A Question of Variety —

Other things being equal, the electrical dealer who will make the most money is the one who moves his stock most rapidly, who makes the largest possible number of turnovers. Usually such a dealer is the one who carries a good variety, a good assortment of stock rather than a large stock in any one line. With the present unsettled condition of prices it is more than ever important that every dealer give this phase of the business the most careful attention.

SPARKS—Current Facts, Figures and Fancy

(Vacuum cleaners for street cleaning, wireless telephones for forest protection and metal checks for car fares are among the recent ingenuities of the busy human animal. Steam railways and Mexican financiers, however, are still giving trouble, and the tractor seems to have outwitted the statisticians in a mysterious manner.—The Editor)

The recent destruction of two thousand acres of wheat by a fire started by sparks from an engine suggests food conservation as another argument for the electrification of railroads.

* * *

There are more automobiles on the streets of Calcutta than any other kind of vehicle. All the automobiles imported into the city since the signing of the armistice and the removal of the import embargo have been of American manufacture.

* * *

At the end of 1917 there were 152,000 persons in Japan on the waiting list for telephone installation. The demand is so great that when one subscriber is ready to give up his telephone he sells it through a broker, at a regular market value.

* * *

To the office clerk who indulges in twenty cents worth of coffee and doughnuts for lunch the feat of a pair of rats who ate a restaurant meal costing $359 is something to be remembered. The meal consisted of greenbacks which the manager of a restaurant had tucked behind the ice-chest.

* * *

In the No Accident week, recently conducted by the United States Railroad Administration, forty-eight out of sixty roads in the Central Western Region—the winning district—showed a clear record, and the others reduced accidents seventy-nine per cent over the same week in 1918.

* * *

The vacuum cleaner, having established its reputation with regard to carpets, is now extending its activities to streets. In Los Angeles it has almost entirely replaced water-flushing in the cleaning of paved streets, and four machines, working two shifts of eight hours each, clean approximately 1,500,000 square yards of pavement a day.

* * *

In spite of the decreasing use of horses and the prophecy that less land would be used for growing horse feed, figures for last year show an increase of 44 per cent over those of 1916 in the acreage planted with oats. The only explanation seems to be that farmers with tractors are keeping their horses as pets or feeding the tractors on oats.

* * *

Wireless telephones are being tried out by the federal government in connection with protection of the national forests from fire. Wire communication has been made ineffective in many cases by falling timber, heavy storms, and snow slides. Four combination sets of transmitting and receiving apparatus have been lent to the Forest Service by the Signal Corps.

* * *

The mysteries of distribution are not simplified for most of us by a recent statement that it costs more to get a barrel of potatoes from the corner grocery to a city home than it does to bring it five hundred miles from where it was grown to the corner grocery store, and that it costs more to put a barrel into a steamship in New York than it does to transport it all the way to Liverpool.

* * *

An Aeronautical Exposition will be held at Amsterdam, the Netherlands, during August and September this year. At the exposition, which is the first of its kind, there will be displayed in addition to the various designs of aircraft and aircraft parts, the innumerable accessories to air travel — flying suits, heating devices, instruments for wireless telegraphy, maps, literature and so forth.

* * *

A water-proof glue with which small beams of wood can be built up into large beams has been invented by the Forestry Department. These built-up beams are stronger than solid beams, and it is said the discovery may have great influence on the timber problem by permitting the harvesting of partly grown trees. It also suggests a dignified future for matches as building material when electricity comes into its own.

* * *

Letting the corn starch burn while you open the door to the butcher is made unnecessary by an ingenious door recently patented in Great Britain. It is double, and designed with compartments into which tradesmen may put packages without disturbing the inhabitants of the house. When the outer door is closed it automatically unlocks the inner door enabling the packages to be removed from the inside. It is mechanically impossible for both inner and outer door to open at the same time.

* * *

Almost everybody has been making money in Mexico. "Make" here is not synonymous with "earn": we refer to the engaging plan devised by Villa, who provided himself with a small hand press and a tramp printer and struck off a few thousand pesos whenever he wanted a new suit. Unfortunately the printer took to loaning the apparatus to his friends, with the result that some $2,000,000,000 worth of engraved certificates have been issued in Mexico of recent years, some of them on wrapping paper.

PERSONALS

C. L. Chamblin, Manager of the California Electrical Construction Company, who was recently elected President of the State Association of Electrical Contractors and Dealers at the successful and well attended Santa Cruz Convention, is already very well known to the men of the electrical industry as the able chairman of the Electrical Contractor-Dealers' Association of San Francisco. His executive ability as presiding officer and his efficient and enthusiastic work in connection with the organization amply justify the distinction conferred upon him, and warrant the prophecy that the State Association faces an especially active and successful year under his capable leadership.

Geo. W. Boschke, mechanical engineer of Portland, Ore., is among recent visitors from the Northwest to San Francisco.

H. A. Olds has opened an office in the Rialto Bldg., San Francisco, for the Smith-Booth-Usher Co., of Los Angeles, representatives of manufacturers of contractors' equipment.

F. M. Hamilton, superintendent of the department of accident investigation of the Puget Sound Traction Light & Power Company, Seattle, is making a business trip to Philadelphia.

S. S. Jackson, formerly proprietor of the Berkeley Electric Construction Co., and recently returned from overseas service with the A. E. F., is now with the Levy Electric Co., of San Francisco.

R. H. Gregery, Comptroller of the Western Electric Company with headquarters in New York, has arrived in Los Angeles for a brief stay to study business conditions in Southern California.

A. I. Whitehead has been transferred from District Agent of the Southern California Edison Company, Vernon, to District Agent of the Mt. Whitney Power & Electric Company, Porterville.

Hal Lauritzen, Western Representative of the Duplex Light Works of the General Electric Company with headquarters in New York, arrived in Los Angeles last week and intends to tour the Pacific Coast before returning East.

D. W. A. Peaslee, formerly professor of electrical engineering in the Oregon Agricultural College and recently in France as a Captain of Engineers, has just been appointed chief engineer of the Jeffery-DeWitt Insulator Company.

Frank S. Easton, formerly with the British Columbia Electric Railway at Vancouver, has entered the employ of the Mexican Light & Power Company, of Mexico City, and expects to be engaged in the company's work in South America for some time.

E. J. McIlraith, formerly superintendent of ways and structures with the Puget Sound Traction Light & Power Company at Seattle, has been appointed to the position of engineer in charge of maintenance with the Philadelphia Rapid Transit Company.

L. A. Wallon has recently returned from Chicago where he was drafted by Stone & Webster on the indexing system for the appraisal of the Chicago surface lines, and is again on his job as assistant engineer of the Puget Sound Traction Light & Power Company at Seattle.

Tracy A. Johnson, vice president of the corporation that directs the Colorado Springs Light, Heat & Power Company, is in Colorado Springs for an indefinite period to cooperate with R. L. Holland, resident vice president of the company, in the matter of refinancing the local company.

F. E. Pernot, Assistant Professor of Electrical Engineering at the University of California, is the author of an eight-page engineering publication just issued by the University of California Press, describing the extension of the step-by-step method of transmission line computation.

J. H. Jamison, of the Westinghouse Electric & Manufacturing Company, Los Angeles, has left for an extended trip throughout the East accompanying **Mr. C. B. Hall,** Secretary and Treasurer of the Illinois Electric Company. They intend to visit Chicago, New York, and Pittsburgh as well as many other large eastern cities.

Elliot Reid, formerly Assistant to the General Manager of the Westinghouse Lamp Company, of New York, has been appointed Sales Manager of the Westinghouse Lamp Company, and in that capacity will be responsible for the commercial activities of the Company in both large and miniature classes of lamps in domestic territory.

C. B. Hall, Secretary and Treasurer of the Illinois Electric Company has left Los Angeles for the East to visit the Eastern branch of his company. He is also planning to visit the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company and other large electrical manufacturers which he represents on the Pacific Coast.

I. W. Alexander, of the San Joaquin Light & Power Corporation, and chairman of the Publicity Committee of the Pacific Coast Section N. E. L. A., has recently been laid up in a Sanitorium near Fresno, recuperating from an operation for appendicitis. Mr. Alexander is fast getting back into trim and will be back at his work again in a few days.

Chas. Listenwalter and **P. G. Gough,** of Listenwalter & Gough, Electrical Jobbers, in Los Angeles, have recently returned from the East where they have been appointed exclusive distributors for the new Blue Bird Appliances in Southern California and Arizona. The Listenwalter & Gough Company have recently joined the Electrical Supply Jobbers on the Pacific Coast.

Samuel Russell, Jr., District Manager of the Crocker-Wheeler Company's district office at Philadelphia, has been a visitor in San Francisco for the past week. Mr. Russell is a pioneer in the electrical business, having entered it in 1888 soon after his graduation from Brooklyn Polytechnic Institute. Mr. Russell visited Seattle and Portland, and while in San Francisco has been looking after his company's interests in connection with the San Francisco district office.

Harry G. Holabird, long known as the Los Angeles representative of the Holabird Electrical Co., announces that in future he will devote all his time and energies to the business of the Ohio Brass Company, who manufacture high tension insulators and overhead trolley material; and also to the Central Tube Company of Pittsburgh, who manufacture rigid iron conduit. Harry Holabird is one of those pleasing personalities one likes to see at conventions and in fact in all gatherings where men of the industry meet, and as a consequence all well-wishers of the industry wish him every success in his new field of endeavor.

E. C. Jones, chief engineer of the gas department of the Pacific Gas & Electric Company, San Francisco, has been nominated vice-president of the American Society of Mechanical Engineers. Only in one other instance of its years of eventful history has this distinguished society granted such a recognition to its engineering membership west of the Rocky mountains. The recognition in the case of Mr. Jones comes due to two prime reasons—first as an engineer he has brought credit and distinction to the profession, especially in his genius displayed in oil gas manufacture and second, the unusual interest and activity in affairs of the society wherein he has as chairman of the San Francisco Section brought Western engineers and Western ideals into prominence throughout the nation. All well-wishers of the West offer to Mr. Jones their heartiest and sincerest congratulations.

A. A. Smith, with the Graham Reynolds Electric Company of Los Angeles, has returned from the east where he has been studying business conditions for his firm.

E. C. Hodges, formerly with the Pacific States Electric Company, in San Francisco, has joined the sales forces of the Western Gas & Electric Appliance Company of Chico, Cal.

H. Alex. Hibbard, General Sales Agent for the T. & W. Universal Plug Company of Santa Ana, California. has returned to Denver after an extended trip through all the large centers of the East.

A. B. Wallaber, former District Agent of the Southern California Edison Company, at San Bernardino, has been appointed District Agent at Pasadena. He is succeeded at San Bernardino by F. A. Williamson.

Tracy W. Simpson, Pacific Coast Manager Federal Sign System (Electric) is in the East attending a conference of his company's officials at Chicago. He will not return to his San Francisco office until about the middle of August.

H. C. Rice, formerly a power salesman with the Southern California Edison Company, and recently discharged from the army, has been appointed Chief Appliance Salesman to succeed H. B. Fletcher, who goes to Van Nuys as district agent.

Frank N. Cooley has been appointed sales manager at Seattle for the Western Electric Company. Mr. Cooley has been in the Northwest for some time, having represented the Company in Seattle as supply specialist and assistant sales manager.

C. E. Houston, for the past six years district foreman of the Southern California Edison Company, Oxnard, California, has recently been appointed District Agent to succeed Mr. Al McKenzie, former District Agent, who has entered the automobile business.

Chas. B. Wing, professor of structural engineering at Stanford University, has returned to his home at Palo Alto, California, from "Over There," where as Lieutenant Colonel of Engineers he has in recent months had a most active part among our expeditionary forces in France.

K. E. Van Kuran, District Manager, and **C. D. LaMoree** Manager of the Supply Division of the Westinghouse Electric & Manufacturing Company, have recently returned from the El Paso office of their company where they witnessed the recent fight between the American and Villa troops.

F. E. Wynne, general engineer of the Westinghouse Electric & Manufacturing Company, was one of a committee of thirteen eminent engineers who recently visited points in Montana for the purpose of inspecting the electrical plants of the Montana Power Company and observing the operation of the electrified lines.

J. F. Kinder has been appointed by the Ajax Electric Specialty Company of St. Louis as their sales representative at Portland, Ore., for the northern coast district. In our July 1st issue, in which this announcement originally appeared, the word "Ajax" was erroneously printed to read "Apex."

Otto B. Goldman, of the Oregon State Agricultural College has been promoted to the rank of professor of mechanical engineering in that institution. Professor Goldman is familiar to readers of the Journal of Electricity as an occasional contributor on heating and ventillating discussions.

W. S. Norviel, an attorney at law of Phoenix, Arizona, has been appointed Water Commissioner of Arizona, where a water code similar to California, Oregon, and other western states has recently gone into effect. Mr. Norviel is a recent San Francisco visitor where he has been in conference with Messrs. Chandler and Johnston of the California Water Commission.

G. J. Schmidt has recently returned East after a brief visit to the Coast, stopping at Seattle, San Francisco and Los Angeles. Mr. Schmidt is connected with the engineering staff of the Westinghouse Electric & Manufacturing Company, and has much to do with the rapid development of the polyphase motor.

Dr. Gitaro Yamakawa, who has for some time been head of the Science and Engineering Department at the Imperial University in Tokyo, is a recent San Francisco visitor. As former president of the illuminating engineering society of Japan, Dr. Yamakawa has had a most active part in electrical matters in his country. His visit in this country will prove unusually welcome.

Gerard Swope, president of the International General Electric Company, has recently arrived in San Francisco en route from the Orient to his New York office. While in San Francisco Mr. Swope was a guest of Dr. Thomas Addison, Pacific Coast manager of the General Electric Company. Mr. Swope is brim full of enthusiasm over the business outlook in the Orient. In an interview with a representative of the Journal of Electricity he stated that business conditions in Japan are very active, while in the great China Republic the future is unquestionably one of great opportunity. Before leaving Tokyo on July 3, a notable gathering of engineering talent welcomed his presence in Japan and at the dinner following, at which he was a guest of honor, the engineering and commercial interests present were unusually cordial in their expression of kindly feeling for him and for the new international organization over which he is chief executive.

Fred D. Weber, Chief Electrical Engineer of the Oregon Insurance Rating Bureau has been elected vice president of the newly created state board of engineering examiners in Oregon. The board calls for a membership of nine—two mechanical engineers, two hydraulic engineers, two civil engineers, two mining engineers and one electrical engineer. This representative appointment comes to Mr. Weber in recognition of his active and effective work in connection with the plan. The question of the licensing of engineers is one which is being widely discussed in all sections of the country, and the Oregon board is one of the first groups to be created for this purpose. Mr. Weber, in addition to his other activities, is representative of the Journal of Electricity in the Northwest.

Meeting Notices for Electrical Men

(Summer vacations are the principal activity of electrical and engineering organizations just at present. Some few, however, still report meetings in spite of the wholesale exodus of members. Chief among these are the Contractor-Dealer Association of Oregon and the Engineers' Club of San Francisco, both of which have been assembling regularly.—The Editor.)

Oregon Association of Electrical Contractors and Dealers

The regular meeting of the Oregon Association of Electrical Contractors and Dealers for District No. 1 met at the Imperial Hotel at 6:30 p.m. June 30. The following firms were represented:

F. A. Bauman & Co.	E. L. Knight & Co.
Beaver Electric Co.	NePage McKenny Co.
Coast Steel & Machinery Co.	Pierce Tomlinson Electric Co.
J. C. English Co.	Scott Electric Co.
Jaggar-Sroufe Co.	Vanderlip & Lord
R. C. Kingery	Western Electric Works

The Executive Committee made an oral report recommending a reduction in dues on the following basis for members of District No. 1, to-wit: Class A members, $15.00 a quarter; Class B members, $18.00 a quarter; Class C members, $21.00 a quarter; Class D members and over, $27.00 a quarter; said dues to become effective July 1, 1919, and that all money so paid in would be the property of and belong to the State Association. It was recommended that the money now on hand in the local Association be kept separate and apart and for the use of the local Association; also that all money collected for dues up to July 1st for local dues to be added to this fund. It was also recommended that for the time at least the Association reduce expenses by doing without a paid secretary and that Mr. Tomlinson act as temporary secretary without compensation; that the offices now located in the McKay Building be retained, and that the business for the time being and until other arrangements be made would be taken care of by the temporary secretary, with the assistance of the members of the Executive Committee. These recommendations of the Executive Committee were adopted.

The matter of Mr. Scott's resignation from the Price List Committee was taken up and Mr. Scott was asked to retain the chairmanship and to act in conjunction with the Merchandising Section in the preparation of future price lists to be printed.

The meeting of July 14 was called to order at 8 p.m. by Chairman Kenney.

Under reports of officers, discussion of back dues was commented upon, and all present admonished to pay up, the same request to be communicated to those absent.

A communication was received from the Builders' Exchange inviting the attendance of the Association at the annual picnic at Crystal Lake Park. It was voted that a personal invitation be issued by the office, urging the individual members to participate in this event. It was further agreed that at least one delegate be designated to represent the Association. The Chair appointed Mr. Green as that representative.

The Executive Committee made mention of certain expenditures necessary for outfitting the office, and authority was given to them to make such expenditures as were necessary in this connection. A request was made that the Legislative Committee be instructed to assist the Electrical Division in the formation of a revised Code.

The publication of a sheet devoted to estimating was discussed and the opinion of the parties who had examined it was that for contractors, who are the ones doing estimating, the sheet contained no information that could not be better secured through the regular trade journals.

Then followed a discussion concerning the Retail Section. It appeared that a number of the members had not been notified of the formation of this section, and it was deemed advisable therefore that this matter be referred back to the Executive Committee who would carefully go into the details concerning the necessity of this section, and who would define the scope of its activities.

Jovian Electric League

The Jovian Electric League of Los Angeles have discontinued their meetings for the summer months. The first meeting of the coming year will be held the first Wednesday in September at which time Colonel Charles Decker, an engineer recently returned from France, will be the principal speaker.

Association of Electrical Contractors and Dealers

The National Association of Electrical Contractors and Dealers held a four days' convention in Milwaukee, Wis., recently. The registered attendance was approximately 350. The national executive committee meetings were held on the two days preceding the convention, the principal subject of discussion being the bureau of education and research which the association will organize in cooperation with the manufacturers, jobbers and central stations of the country. The plan was heartily endorsed and the discussion related mainly to methods of financing it. The outcome was that the manufacturers would supply funds for national work to be directed by the Contractor-Dealer Association, and funds for carrying out work in local territories was to be raised in each case by subscription from all interested locally.

The convention proper was opened by addresses of welcome delivered by Paul C. Burrill, chairman of the Wisconsin State Association, and Cornelius Corcoran, acting mayor of Milwaukee. W. Creighton Peet, president of the national association, stated in his response that the membership of the

BUILDERS OF THE WEST — LVIII

C. R. WEYMOUTH

Fuel oil in its power generating characteristics is proving in these stirring days of readjustment to be a matter of prime importance on land and sea. Far beyond the borders of our great West the fame of western engineers has traveled in the matter of economic utilization of this wonderful natural resource in the generation of steam electric power. To C. R. Weymouth, Chief Engineer of Chas. C. Moore & Company, Inc., engineers of San Francisco, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his establishment of economy records of fuel oil utilization hitherto unattained in the achievement of steam engineering practice.

association had increased 35 per cent during the year in spite of unfavorable conditions. Mr. Peet recommended consistent reading of the trade journals as a means of making the most of opportunities. Among the topics treated in papers read at the various sessions were "Keeping Up with Rising Costs," "Cooperation in Business" and "Estimating Forms and Methods."

National Electric Light Association

President R. H. Ballard has sent out to member companies of the National Electric Light Association a questionnaire, as follows:

(1) Have you any suggestions to make which might aid in carrying out our desire to be of service?
(2) Have you any problems concerning which you would like information which might help in their solution?
(3) What suggestions can you offer resulting from your experience which might benefit other companies in the conduct of their affairs?

The object of this is to encourage the interchange of thought and cooperation along constructive lines which is so necessary in the Association's work, particularly at this period. It is President Ballard's wish to make the Association a clearing house for information regarding the problems of the members.

American Association of Electrical Engineers

The following are among the western members elected to Associate membership in the American Association of Electrical Engineers, June 25, 1919:

Ernest E. Aldous, Asst. Manager, Denver Office, American Steel & Wire Co., Denver, Colo.; Harry Archer, Erecting Engineer, General Electric Co., Seattle, Wash.; John Earl Atkinson, Machinery Application Engineer, Westinghouse Electric & Manufacturing Co., Seattle, Wash.; Charles D. Bronson, Load Dispatcher, Pacific Gas & Electric Co., Oakland, Cal.; Nicholas Everett Brown, Gen. Supt., U. S. Electrical Mfg. Co., Los Angeles, Cal.; William M. Brown, Inspector, Colorado Fuel & Iron Co., Pueblo, Colo.; James Springer Burton, Substation Operator, Puget Sound Traction, Light & Power Co., Seattle, Wash.; Leslie M. Butcher, Examiner, Educational Department, Mountain States Tel. & Tel. Co., Denver, Colo.; James C. Caine, Deputy City Electrical Inspector, City, Hall, North Portland, Ore.; Aaron B. Cayo, Chief Tester, Portland Railway, Light & Power Co., Portland, Ore.; John Nelson Chamberlin, Plant Engineer, Pacific Tel. & Tel Co., San Francisco, Cal.; William J. Cottrell, Engineer-Salesman, H. W. Johns-Manville Co., Portland, Ore.; Calvin Orrin Crane, Electrical Engineer, Idaho Power Co., Boise, Ida.; Edwin J. Des Camp, Sales Engineer, Western Electric Co., Seattle, Wash.; Harold Farley Elliott, Production Manager, Federal Telegraph Co., Palo Alto, Cal.; Alan Wymar Eshelby, Railway Engineer, Westinghouse Electric & Mfg. Co., Seattle, Wash.; James W. Ferguson, Division Foreman, Seattle Municipal Light Plant, Seattle, Wash.; Andrew Forbes, Electrician, Portland Railway, Light & Power Co., Portland, Ore.; Andrew Clayson Freese, Chief Inspector, Colorado Fuel & Iron Co., Pueblo, Colo.; Stephen E. Gamble, Sales Engineer, Westinghouse Electric & Mfg. Co., San Francisco, Cal.; Lew Wallace Going, Acting Chief Electrical Inspector, Electrical Division, City Hall, Portland, Ore.; Adolphe Griffith, Inspector of Electrical Equipment, Colorado Fuel & Iron Co., Pueblo, Colo.; Clyde C. Hayden, Foreman of Substations, Southern Pacific R. R. Co., Oswego, Ore.; William F. Hedin, Load Dispatcher, Portland Railway, Light & Power Co., Portland, Ore.; L. E. Hinman, Asst. Engineer, Southern Pacific R. R. Co., Portland, Ore.; George L. Hoard, Private, M. G. Co., 28th Infantry, U. S. Army, Seattle, Wash.; Carl H. Hoge, Distribution Engineer, Puget Sound Traction, Light & Power Co., Seattle, Wash.; Perry L. Jewett, Head Electrician, Sunset Field Division, Southern Pacific Co., Fuel Oil Dept., Kerto, Kern Co., Cal.; Henry R. Jones, Gang Foreman, Construction Elec. Dept., Colorado Fuel & Iron Co., Pueblo, Cal.; Raymond Leslie Jones, Engineer of Equipment Costs, The Pacific Tel. & Tel. Co., Oakland, Cal.; William L. Kimmel, Member of Firm, Nixon-Kimmel Co., Spokane, Wash.; A. H. Kruel, Electrical Engineer, Portland Railway, Light & Power Co., Portland, Ore.; Patrick Fred McBan, Illuminating Engineer, Washington Motion Picture Corp., Spokane, Wash.; Chester Arthur Montgomery, Salesman, Westinghouse Electric & Mfg. Co., San Francisco, Cal.; Paul B. Munson, Mechanical Application Engineer, Westinghouse Electric & Mfg. Co., Seattle, Wash.; Arthur Percival Newberry, Chief Operator, White River Generating Station, Puget Sound Traction, Light & Power Co., Dieringer, Wash.; Robert D. O'Neil, Supt. of Inside & Underground Construction, Tacoma Light Dept., Tacoma, Wash.; Conrad P. Opitz, Station and Dist. Operator, Puget Sound Traction, Light & Power Co., Renton, Wash.; Frank Arthur Parmelee, Electrician, Colorado Fuel & Iron Co., Minnequa Works, Pueblo, Colo.; George T. Pfleger, Asst. Manager, U. S. Electrical Mfg. Co., Los Angeles, Cal.; Harold A. Rands, Member of Firm, Rands & White, Portland, Ore.; Vincent J. Richards, Foreman, Electrician, Columbia River Shipbuilding Corp., Portland, Ore.; Foy O. Rogers, Patrol & Service Maintenance Foreman, Hydro-Electric Power Plant, Dieringer, Wash.; L. S. Ruble, Salesman, North Coast Electric Co., Portland, Ore.; Gilbert L. Scoville, Engineering Dept., Pacific Tel. & Tel. Co., San Francisco, Cal.; Gordon Russell Shuck, Instructor of Electrical Engineering, Univ. of Washington, Seattle, Wash.; Ernest A. Smith, Electrical Foreman, Inspiration Cons. Copper Co., Miami, Ariz.; Leo. D. Snow, Foreman of Testing Laboratory, Puget Sound Traction, Light & Power Co., Seattle, Wash.; Thomas James Spencer, Puget Sound Traction, Light & Power Co., Dieringer, Wash.; Albrecht Strieff, Operator, Northwest Electric Co., Hillsdale, Ore.; Robert J. Stull, Testing & Regulating Attendant, Western Union Tel. Co., San Francisco, Cal.; Hugo B. Sturges, Department Electrical Inspector, City of Portland, Portland, Cal.; W. I. Teague, Division Supt. of Plant, The Pacific Tel. & Tel. Co., San Francisco, Cal.; A. A. Tobey, Electrical Contractor, Portland, Ore.; W. D. Turner, Electrician, Colorado Fuel & Iron Co., Pueblo, Colo.; J. Wallace, Central Office Engineer, Pacific Tel. & Tel. Co., San Francisco, Cal.; Walter J. Walsh, Operator, Butte Electric Railway Co., Butte, Mont.; William Henry Warren, Transmission Inspector, Pacific Tel. & Tel. Co., San Francisco, Cal.; John Ford Warris, Lieut. (j.g.), U. S. N., Executive Officer and Electrical Officer, U. S. S. S.-33, Union Iron Works, San Francisco, Cal.; Jay Maxwell Wauchope, Chief Electrician, International Smelting Co., Tooele, Utah; Wilfred A. White, Engineer, North Coast Power Co., Portland, Ore.; Norton Parker Wilson, District Service Manager, Westinghouse Electric & Mfg. Co., Seattle Wash.; Noble A. Wright, Electrical Engineer, The Schaw Batcher Co. Pipe Works, San Francisco, Cal.

Engineers' Club of San Francisco

On July 12th the Engineers' Club of San Francisco enjoyed an interesting talk from Lieutenant-Colonel Chas. B. Wing of Stanford University. Lieutenant-Colonel Wing has just returned from France and this meeting was the occasion for a large gathering of his many friends and associates.

San Francisco Electrical Development League

The San Francisco Electrical Development League has temporarily suspended meetings. The fact that so many members are taking vacations at this time of year makes it convenient for the club itself to take a brief vacation.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—Calvert Townley, Westinghouse Electric & Manufacturing Company.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman—J. H. Cunningham, General Electric Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—W. D. Scott, Pacific Telephone & Telegraph Company, Portland, Ore.
Secretary—E. H. Le Tourneau, Portland Railway, Light & Power Company, Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman—Prof. H. S. Evans, Univ. of Colorado, Boulder.
Secretary—Robt. B. Bonney, Mountain States Tel. & Tel. Co., Denver, Colo.
Meetings—Third Saturday of each month, at the Shirley Hotel.

San Francisco Section
Chairman—W. G. Vincent, 445 Sutter St., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section
Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—T. C. Smith, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section
Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman—A. E. McMahon, University of California, Berkeley, Cal.
Secretary—D. D. Davis, University of California, Berkeley, Cal.

University of Colorado Branch
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Meetings — First Wednesday evening of each month from October to June.

University of Washington Branch
Chairman—Jack Tolmie, Univ. of Washington, Seattle.
Secretary—Glen Walker, Univ. of Washington.
Meetings—Monthly, first Tusday, Forestry Bldg.

Oregon Agricultural College Branch
Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.
Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Montana State College Branch
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Throop College of Technology Branch
Chairman—Mark Sawyer, Throop Dormitory, Pasadena, Cal.
Secretary—Russell Otis, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary—W. H. Morton, 110 West 40th St., New York.
Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland, J. F. NePage, Seattle, Wash.

Electrical Contractors & Dealers of Salt Lake City
President—G. W. Forsberg.
Secretary—E. H. Eardley, Eardley Bros., Salt Lake City.

British Columbia Ass'n Electrical Contractors and Dealers
President—E. Brettell, Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—M. A. De Lew, 180 Jessie St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Denver Electrical Contractors' Association
President—E. C. Headrick.
Secretary—C. N. Shannon, 227 Coronado Bldg.
Meetings—2nd and 4th Monday nights of each month.

Electrical Contractors and Dealers Ass'n of San Francisco
President—C. L. Chamblin, 641 Mission St., San Francisco.
Secretary—Louis R. Ardouin, San Francisco.
Meetings—Friday, 12:30; New Call Bldg.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—D. K. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon State Ass'n of Electrical Contractors and Dealers
President—R. C. Kenney, 388 Burnside street, Portland.
Secretary—J. Willis Oberender, 209-10 McKay Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers
President—Roy C. Kenney, Portland.
Secretary — J. W. Oberender, 209-10 McKay Bldg., Portland.
Meetings—Alternate Mondays at Imperial Hotel Grill.

Sacramento Section, California Electrical Contractors & Dealers' Association
President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Washington Ass'n of Electrical Contractors and Dealers
President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings — Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—T. E. Bibbins, 575 Mission St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign
Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.
Secretary—Captain Howard Angus, New Call Bldg., San Francisco.

Colorado Electric Light, Power and Railway Association
President—E. A. Phinney, Jefferson Co. Power & Light Co.
Secretary-Treasurer—F. P. Safford, Denver Gas & Electric Co., Denver, Colo.

National Electric Light Association
President—R. H. Ballard, Southern California Edison Company.
Secretary—T. Comerford Martin, 29 West 39th St., New York.

Nebraska Section, N. E. L. A.
President—T. H. Fritts, Central Power Company, Grand Island, Neb.
Secretary-Treasurer—B. H. Conlee, Beatrice Gas & Electric Company, Beatrice, Neb.

Nevada Section, N. E. L. A.
Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.
President—A. E. Wishon, San Joaquin Light & Power Corporation, Fresno, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Electric Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.
Chairman—F. H. Murphy. Portland Railway, Light & Power Company.
Secretary—Geo. Bowen, Portland, Ore.

Illuminating Engineering Society
President—S. E. Doane.
Secretary—Clarence L. Law.
Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
Meetings—First Tuesday each month.

New Mexico Electrical Association
President—D. W. Morgan, Las Cruces, N. M.
Secretary—Charles Twogood, Albuquerque, N.M.
Meetings—Annually, in February.

Southwestern Electrical and Gas Association
President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—H. J. Gille, Puget Sound Traction Light & Power Co.
Secretary—W. E. Herring, Puget Sound Traction, Light & Power Co.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

Los Angeles Jovian Electrical League
President—A. E. Peat, San Joaquin Light & Power Corp.
Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—Henry Bostwick, 445 Sutter St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—H. N. Beecher, City Hall, Los Angeles.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
President—Mortimer E. Cooley, Electrical Engineering Dept., AnnArbor, Mich.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—W. F. Durand, Stanford University, Palo Alto, Cal.
Secretary—Jas. A. Kinkead, Rialto Bldg., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—John W. Cunningham, 414 Spalding Bldg., Portland.
Secretary—Orrin E. Stanley, Box 973, Portland.
Meetings—Annual: First Monday in February. Monthly: Third Thursday of each month. Third Thursday of each month.

The Engineers' Club of Seattle
President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—A. E. Chandler, New Call Bldg., San Francisco.
Secretary—J. R. Brownell, Manufacturers' Indemnity Exchange, San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President — W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President — George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

Colorado Engineering Council
President—Arthur Ridgway, 810 Equitable Bldg., Denver.
Secretary-Treasurer—Robert J. Grant, 614 Interstate Trust Bldg., Denver.

United Engineering Societies of San Francisco
Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

Joint Committee Technical Societies of Los Angeles
Chairman, George A. Damon, San Fernando Bldg., Los Angeles.
Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

Utah Society of Engineers
President—Leonard Cahoon.
Secretary—Wm. H. Kelsey.
Meetings—3rd Wednesdays except May, June, July and August.
Annual banquet—May.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—John Campbell Merriam, University of California; Acting Chairman National Council of Research.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

Portland Section A. S. C. E.
President—P. H. Dater, Eng. U. S. Forestry Service.
Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
Meetings—At call of president.

Spokane Engineering & Technical Ass'n
President—L. K. Armstrong, A. S. M. E.
Secretary—A. D. Butler, City Engineer, Spokane, Wash.
Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Los Angeles Transportation Association
President—C. G. Krueger, 324 S. Broadway, Los Angeles.
Secretary—D. W. Ferguson, 324 S. Broadway, Los Angeles.

HAPPENINGS IN THE INDUSTRY

NEW CONSTRUCTION IN COLORADO

Julesburg, Colo., is constructing a new power house which will supply power and light for Sedgewick and Ovid, Colo., as well as for Big Springs, Neb. The concrete building will contain in addition to the power plant, the Superintendent's office, council room, fire department and ice plant.

The power equipment is as follows:

Two 200 h.p. Heine boilers
Two 750 gal. per. min. centrifugal pumps.
Two 24 in. wells, concrete casings and strainers, or Kelley well systems.
Western Electric generator, 300 kva.
Old unit transferred to new plant, 150 kva.
Ames Uniflow Engine

The Henningsen Engineering Company of Omaha, Neb., are the Engineers.

In Julesburg a new White Way will be constructed through the main streets, consisting of ornamental poles and 100-watt lamps. Steam heat will be supplied to business blocks.

STATISTICS OF THE DOHERTY INTERESTS

The publication of statistics concerning the great electric power utilities of California in the Journal of Electricity for April 15, 1919, has called forth nation wide interest in this subject—especially the fact that the interconnected systems of the Pacific Gas & Electric Company and the Sierra & San Francisco Power Company constitute the greatest electrical network in the world with its billion and one half of kilowatt hours of energy delivered annually to consumers of electric power.

Another feature of interest that awakened nation wide attention was the dedication of that particular issue to H. M. Byllesby for his effective work, covered not in concentrated power service but in a system of widely separated yet efficient utility organizations.

Readers of the Journal of Electricity have long been familiar with the splendid accomplishments of the Denver Gas & Electric Company. Few, however, are aware of the details of the Henry P. Doherty organization, known as the Cities Service Company, of which the Denver Gas & Electric Company is a part.

This organization with its half a hundred subsidiary organizations in various communities of America is today in the aggregate, producing over seventeen million barrels of oil annually, forty-six billion feet of natural gas, six billion cubic feet of artificial gas, carrying over a hundred million passengers annually over its electric railways and selling electrical energy to the amount of over a half billion kilowatt hours.

To give our readers a full conception of the subsidiaries and communities served by the Cities Service Company, we append below the following:

Oil and Refineries

	1918	1917
Barrels of Oil Produced	17,032,692	11,675,505
Number of Oil Wells Owned	3,137	2,655
Daily Refining Capacity (Barrels of Crude Oil)	33,585	33,585
Oil Storage Capacity in Barrels	6,447,541	5,997,887
Number of Tank Cars Owned and Leased	2,323	1,749
Number of Distributing Stations (Excluding Foreign Countries)	165	151

Natural Gas

Gas Sold in Cubic Feet	46,814,889,000	42,355,746,000
Number of Gas Wells Owned	2,181	1,914
Miles of Gas Mains Owned	4,529	3,818
Population Served	976,985	913,000

Artificial Gas

Sales in Cubic Feet	6,112,357,000	3,080,584,000
Twenty-four Hour Capacity in Cubic Feet	18,523,000	18,082,000
Number of Customers	103,041	96,269
Miles of Mains on 3-inch basis	1,748	1,631
Population Served	1,031,000	964,000

Electric Light and Power

Kilowatt-hours Sold	513,714,799	406,015,212
Kilowatts Installed Capacity	268,363	238,765
Kilowatts Connected Load	442,333	388,046
Number of Customers	169,618	144,399
Population Served	1,286,000	1,146,000

Electric Railways

Number of Passengers Carried	109,174,092	115,657,669
Miles of Track	407	374
Number of Cars Owned	908	849
Population Served	574,285	541,285

THE CARIBOU HYDROELECTRIC PROJECT

The Great Western Power Company has finished the preliminary engineering work on its great Caribou hydroelectric project, carrying all this out with its own engineers. A general plan of construction has been decided upon and the contract let to Stone & Webster of Boston. Work is now actually under way, with 150 men engaged in preliminary construction, a number that officials of the company say will be increased to over 1,000 men inside of a few weeks. If the work progresses according to schedule, the project will be completed within two years, the company having been successful in financing and having the means to carry it out to completion.

The transmission lines will carry 175,000 volts, which is a greater voltage than is now carried by any transmission system in the world, and this big load will be carried with safety, and security.

FIXING OF RE-SALE PRICES

The Federal Trade Commission in a special report to Congress has renewed its recommendation made last December that manufacturers be permitted by law to fix and maintain resale prices, subject to review by a disinterested agency.

The Commission says that such a law would remove present complexity in the business world, promote the efficiency of manufacturing and commercial institutions and serve the interest of the consuming public.

The Commission's recommendations, it stated, were based on the following conclusions:

(1) That producers of identified goods should be protected in their intangible property right or good-will, created through years of fair dealing and of sustained quality of merchandise;
(2) That the unlimited power both to fix and to enforce and maintain resale prices may not be made unlawful with safety; and
(3) That unrestrained price-cutting is not in the public interest, and tends, in the long run, to impair, if not to destroy, the production and distribution of articles desirable to the public.

In endorsing the action of the Federal Trade Commission, the American Fair Trade League comments as follows:

The Colgate decision can only be effective in controlling retailers who buy directly from manufacturers. If a manufacturer sells to jobbers there is nothing to prevent the price cutting retailer from securing goods through jobbers and continuing to snap his fingers at the manufacturer's standard price policy. The difficulties of manufacturers dealing exclusively with the jobbing trade are really increased by the decision because of the advantage which it gives to producers selling exclusively through retailers.

Under the Commission recommendation, manufacturers desiring to fix and maintain resale prices would file with an agency to be designated by Congress, descriptions of their articles, contracts of sale, and the price schedules to be maintained. The disinterested agency would be charged with the duty, "upon complaint of any dealer or consumer or other party at interest," to review the terms of contracts and prices.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

One feature of the coming Exposition of Chemical Industries to be held in Chicago, September 22nd to 27th, will be the number of electric furnace exhibits; all the foremost companies will be there. The activity of the war period produced an increased interest in metals, not only in new alloys and in treatment of metal but in the method of manufacture. It is a sign of the times that earlier interest in electric furnaces which was of a scientific interest, now has an industrial interest and plant men all over the country are turning their attention to this developed means of smelting metals.

The advancement of electrochemistry particularly as related to electric steel, brass, bronzes, and the furnaces used, has created an interest which reaches beyond the strictly electrochemical field, and we now find the American Institute of Mining & Metallurgical Engineers joining with the American Electrochemical Society in a meeting during the Exposition to discuss Electric Steel and Electric Furnaces; in the evening after the meeting a program of motion pictures upon various phases of electric furnaces in their operation will be shown at the Exposition.

Among the numerous instruments, devices and apparatus that will occupy no small space among the exhibits are those which have been perfected during the war period for precise measurements of temperature, weights, volumes, velocities, flow of liquids, gases, solids, electric current and any and all kinds of commodities that are to be measured. There will be many exhibits of engineering devices and articles of equipment for plants and factories in general; notable among these are conveying systems, elevating systems, weighing and measuring devices, tiering and stacking machinery as well as hoists and cranes.

There will be exhibits of the varied safety appliances used, and the United States Bureau of Mines will feature their safety work in the plant and the mine.

There is also being arranged a program of speakers and motion pictures by the Exposition managers; the speakers will be of national prominence; men of affairs from the midwest will be there to welcome the visitors from other parts of the country and speakers from the industries known to all our readers will be present.

Many exhibitors are bringing moving picture films they are now preparing.

The titles of some of the films to be shown are: "Continuous Motion Conveying, Stacking, Elevating, Loading and Unloading by Brown Portable Handling Machines—(Courtesy Brown Portable Conveying Machinery Company).

"Resistance Type Furnace for Melting Non-ferrous Metals," and "Electric Furnaces in the Heat Treatment of Essential War Materials"—(Courtesy of Electric Furnace Company).

"The Detroit Rocking Electric Melting Furnace in Operation,"—(Courtesy Shawinigan Water & Power Company).

"The Manufacture of Zinc Oxide,"—(Courtesy New Jersey Zinc Company).

The U. S. Government is now preparing through the Bureau of Mines, numerous technical subject films, embracing all of that Bureau's work. These will have their first showing at the Exposition.

PACIFIC GAS & ELECTRIC TRANSACTION

Arrangements have been concluded for the purchase by the Pacific Gas & Electric Company of the entire properties of the Northern California Power Company which supplies Shasta, Tehama, Butte, Colusa, and parts of Yolo and Trinity Counties with electric light and power.

"The Northern California Power Company has 525 miles of high-tension lines and 1611 miles of low-tension lines. It possesses a very valuable power site on the Pit river and owns six hydroelectric generating plants on Battle creek and Cow creek, with an aggregate installation of nearly 50,000 horsepower. At present the Northern is producing and marketing 30,000 horsepower of electric energy."

The Northern Calfornia Power Company has a capitalization of $10,000,000 common stock, all outstanding. The Company has received authority to issue $2,000,000 of preferred stock. Its bonded indebtedness consists of $3,964,000 consolidated bonds, $937,000 underlying bonds and $900,000 guaranteed bonds.

The terms of sale are $34 a share upon a total issue of 100,000 shares.

RAILROAD COMMISSION DECISION

The Railroad Commission went on record against the practice of consumers demanding extension of service from utility companies and then charging the companies unreasonable prices for land necessary to carry out extensions.

In connection with the case of eleven farmers of Placer county, who had filed an action to compel the Pacific Gas & Electric Company to supply additional water for irrigation purposes, the Commission said:

"This Commission will not permit utilities to charge against their consumers reckless or extravagant expenditures, and neither will it force a utility to pay exorbitant prices for rights of way, such as are here demanded."

The Commission directed the Pacific Gas & Electric Company to make the necessary extensions for service before May 1, 1920, providing the company is able to secure the right of way at a reasonable figure before November 1, 1919.

NAVY YARD DEVELOPMENT

An interesting development took place at the League Island Navy Yard, Philadelphia, on July 1st, when the first heat of steel was made in the "Greaves-Etchells" furnace recently installed by the Electric Furnace Construction Company, Finance Building, Philadelphia, in the new foundry.

The foundry itself is said to be one of the most modern and up to date in the whole of the U. S. A., and the manufacture of steel in this yard opens up very interesting possibilities for larger future development.

TRADE NOTES

Electric Furnace Activities —

The Electric Furnace Construction Company, Finance Bldg., Philadelphia, reports the receipt of the following orders for "Greaves-Etchells" Electric Furnaces:

Sullivan Machinery Co., Claremont, N. H., 1-ton furnace.

Imperial Japanese Mint, Osaka, Japan, furnace for manufacture of coinage bronze.

Western Contract —

Further evidence that our great West is coming into its own in the manufacturing world is provided in the recent award by one of the big Southern California power companies of the contract for the hydraulic units for two new installations. The units will be the largest ever installed on the Coast and will be built in San Francisco by the Pelton Water Wheel Company. The units are 22,500 h.p. capacity each. The consulting engineers, eastern men, familiar with eastern practice and manufacturing, awarded the contract to the local firm in the face of extremely keen competition.

New Business Connection —

The General Electric Company has acquired an interest in the Trumbull Electric Manufacturing Company, of Plainville, Conn. The present management of the Trumbull Electric Manufacturing Company still retains a financial interest in the company and will continue in active charge of its manufacturing and selling policy.

The Trumbull Electric Manufacturing Company has an enviable reputation, national in its scope, as large manufacturers of knife switches and safety-first iron box enclosed switches as well as a general line of miscellaneous supplies. The General Electric Company feels that an alliance between these two leading manufacturers of goods designed to promote the safety-first feature in service entrance switches, motor control devices, etc., will give considerable satisfaction not only to the present customers of the Trumbull Company,

whose name will remain unchanged, but to the trade in general.

New Installations —

The Sheridan Light & Power Company, of Sheridan, Ore., are installing an additional pair of horizontal turbines in their Willamina plant to increase their capacity 250 horsepower. The turbines are being furnished by the James Leffel Company.

The Colorado Power Company are putting in a new turbine installation at their Denver plant.

Distributors Appointed —

The Sierra Electric Company, San Francisco, California, have been appointed Pacific Coast distributors for the Chicago Solder Company, makers of Kester Self-Fluxing Wire Solder. Both Acid-Core and Rosin-Core Wire Solder will be carried in stock.

New Stores —

Walter Lassen and R. D. Colman have opened an electric shop in Bremerton, Washington.

The Electric Appliance Company, has moved from 118 Spring street, Seattle, to 1214 Third Ave., where a large store room has been fitted up for handling general electrical appliances. The company is specializing in washing and ironing machines.

The Trumbull Electric Manufacturing Company are making a large addition to their factory at Plainville, Conn., which will give them one-third more floor space. The new facilities to be installed will be devoted to the manufacture of safety switches.

Price Increase —

The Edison Storage Battery Supply Company announce an increase of price in all types of Edison Storage Batteries, on account of the prevailing high prices of labor and material. The increase approximated 10 per cent and became effective July 1, 1919.

New Offices —

H. Alex. Hibbard, General Sales Agent for the T & W Universal Plug Co., of Santa Ana, Cal., has opened offices at 9 So. Clinton St., Chicago, from which all business will be transacted for the eastern and middle states. Stock will be carried in Chicago, and shipments made from this point.

Change of Business —

The Holabird Electric Company have retired from the Electrical Jobbing business in Los Angeles and Southern California, and will devote their entire efforts to the sale of the products of the Ohio Brass Company, the Central Tube Company, and the Condit Manufacturing Company, distributors of Chase-Shawmut Fuses and Fuse Blocks. They will sell Central Tube and the Chase-Shawmut line only through the recognized Electrical Jobber, but will continue handling the Ohio Brass products directly to the customer.

Removal Notices —

The Wagner Electric Manufacturing Company, of St. Louis, announces the removal of its Philadelphia office, service station and warehouse to 1632-34 Sansom street.

The Booth-Hall Company, of Chicago, formerly of 2307-15 Archer Ave., have moved their sales and commercial offices to Rooms 1007-1008 Hearst Bldg., 326 West Madison Street.

TURBINE AND WATER WHEEL

A Letter to the Editor

A question has recently been raised regarding the use of the word "turbine" when referring to either of the two types of hydraulic prime movers now universally used.

The word "turbine" is the proper generic term for either the impulse or reaction types, and not water-wheels, though early developments have influenced such use. A turbine, according to two standard dictionaries, is "a wheel turning on a vertical axis and driven by steam or water" (modern developments have modified this definition in that a turbine may be either vertical or horizontal). The authorities go further to define a reaction turbine as a "turbine in which the water passes axially and is discharged tangentially through buckets that move by its reaction," and an impulse turbine as "a turbine, the rotation of which is caused by water impinging against the buckets."

The term "water wheel," as its name implies, may be any form of wheel energized by water, but modern practice has practically discarded any but the impulse and reaction types. The word water-wheel has come to be used almost inseparably with the word Pelton, as indicating the impulse type of turbine, though it should be confined to the smaller units of standard design. Webster does not seem to give the word "waterwheel" a place in his work at all, while Funk and Wagnalls refer to a Pelton waterwheel as a "wheel in which the water is ejected at the nozzle under high pressure against the buckets."

The invention and development of the impulse type of wheel carried on under the supervision of Mr. Lester Pelton, has standardized the use of the term "Pelton Waterwheel" far beyond the efforts of the manufacturer to protect his goodwill endowment, and many times references have been made to competitive "Pelton Wheels."

The term "Pelton waterwheel" may be used when signifying the impulse type of turbine, but the words "wheel" or "waterwheel" alone are being discarded in favor of the word "turbine."

Very truly yours,
THE PELTON WATER WHEEL COMPANY

WATER RIGHT BIOGRAPHY—No. 1 J. C. STEVENS

The West has led the world in the matter of effective water right legislation. The Journal of Electricity has carried this message to every quarter of civilization where water is a matter of prime importance, so that the writings of such men as John H. Lewis, C. E. Grunsky and A. E. Chandler are now on file in all the great libraries and universities. The result of this effective work has accomplished the introduction of these writings—notably those of A. E. Chandler—into our universities and colleges as text books on the study of water law for engineers.

In order that permanent records may be made of all those who have had a prominent part in water right evolution in the West, the Journal of Electricity will from time to time note brief biographical sketches of the leaders in this work.

Our first sketch will cover the activities of J. C. Stevens, consulting engineer, Spokane, Washington.

Mr. Stevens' life has been devoted to the study and development of water resources. He graduated in Civil Engineering at the University of Nebraska and was Assistant State Engineer of that State before coming to the Pacific Coast in 1906.

Mr. Stevens has held responsible engineering positions in the Government Service, last serving as District Engineer in charge of water supply investigations in the Pacific Northwest. During that period he began a series of reports on The Water Powers of the Cascade Range, published as Water Supply Papers of the U. S. Geological Survey.

He left the Government service in 1910 to engage in private practice. Just prior to the late war he spent nearly three years in Spain as engineer in charge of design and construction of extensive hydro-electric developments for the City of Barcelona and outlying districts. Upon his return to this country he was engineer in charge of the West Okanogan Valley Irrigation District projects, both situated in the State of Washington. He has since devoted his time to general consulting work in connection with irrigation, drainage and water power development.

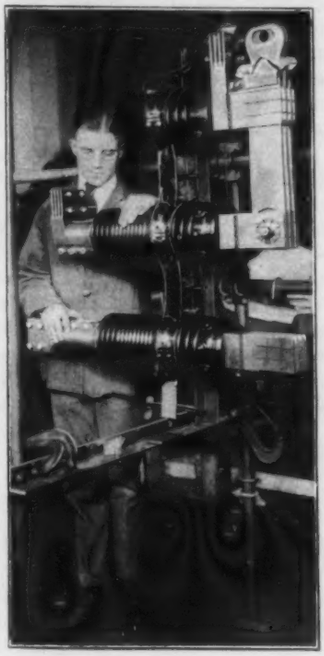
Mr. Stevens is a member of the American Society of Civil Engineers and the Oregon Society of Engineers. He was also a member of the Oregon Conservation Commission for three years and was one of the committee that drafted and secured the passage of the Oregon Water Code in 1909—a law that has become a model for all subsequent water right legislation. Aside from his engineering activities, Mr. Stevens is well known as the originator of the Stevens Water Stage Recorders and Indicators, a series of instruments for direct and long distance recording of water levels.

LATEST IN EVERYTHING ELECTRICAL

(The particular advantage of the electric lantern for all out-of-door uses makes the lanterns described below of special interest in vacation time. Among recent electrical devices for industrial needs, an extra large switch, a powerful electric locomotive, and a new headlight switch for railroad work are here presented. An ammeter adapted to any type of car is also described.—The Editor)

LARGE CAPACITY SWITCHES

Modern power house and Central Station construction is running into larger capacities on the higher voltages every day. The increased load, of course, means larger switches, not only by reason of the large amount of current to be carried on them, but principally on account of the very great mechanical stress possibilities when these busses and switching appliances are subjected to short circuit troubles.



This porcelain-mounted back connected switch is of 4,000 ampere capacity, and is designed to meet the demands of increasing capacities and higher voltages in power house and central station.

The switch here shown of 2,000 ampere capacity is an interesting example of recent switch construction and is probably the largest porcelain mounted, back connected, double throw switch that has so far been built. The forged terminals are shown in place, giving some indication of the bus arrangement on this particular job.

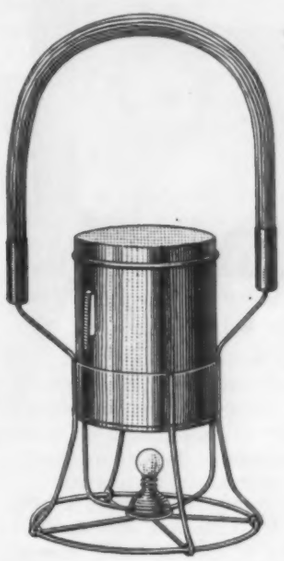
The switch, manufactured by the General Devices & Fittings Co., was installed in the power house of one of our large central states industrials.

ELECTRIC LANTERNS

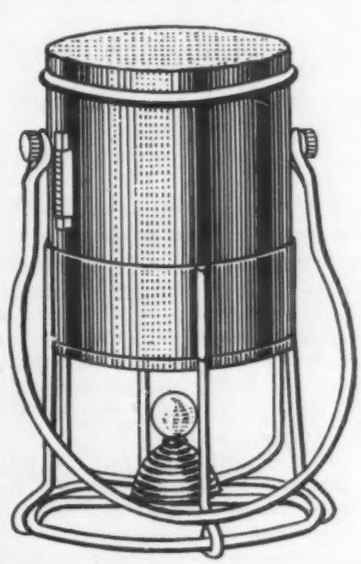
The danger of fire and the inconvenience of smoke and dirt which are features of the old oil lantern are eliminated in the electric lantern. A useful type of this electrical device has been developed by the Conger Lantern Company of 2656 Madison St., Portland, Oregon, in the shape of an "Automobile and General Purpose Electric Lantern."

It has a simple flash-light switch, and adjustable handle and a highly polished, non-tarnishing reflector on the bottom of the case holding the battery. Its size, 6½ by 4½ inches, makes it convenient to handle, and especially useful in automobiling, camping and boating, and it is, of course, not affected by even the strongest wind.

The same company has designed a railroad electric lantern made on a similar plan but with a special rattan handle enabling trainmen to carry it with greater comfort and security than was possible with the old metal handle. The lantern is made especially strong, with steel wires, nickel-plated, and gives a remarkable volume of light. The battery used is a four-cell battery of the Railroad type.



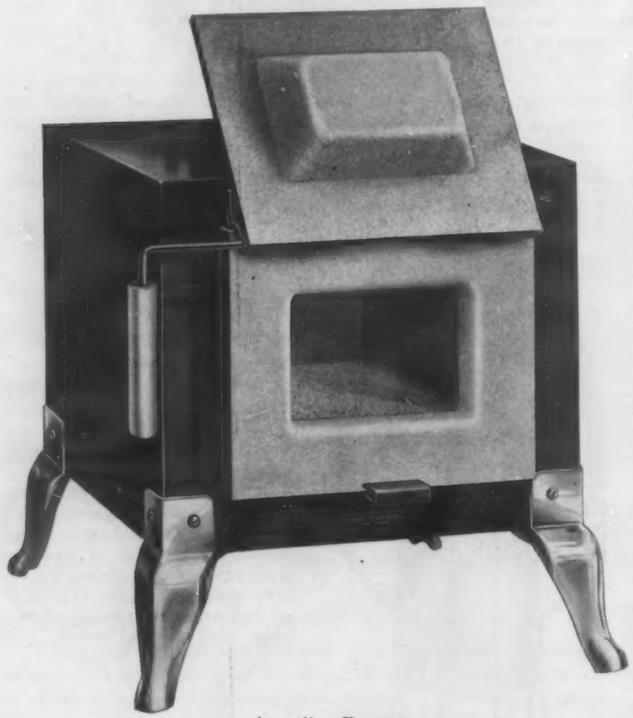
The Conger Electric Railroad Lantern is designed especially for use by trainmen; the absence of smoke and grease, and of any flame which might be dangerous around cars containing explosive material, make this type of lantern particularly desirable for railroad work.



The Conger Automobile and General Purpose Electric Lantern has a special advantage over the ordinary pocket flashlight for camping and automobiling. It can be hung up anywhere or stood on the ground, giving a bright light by which to work, and leaving the hands free.

ELECTRIC FURNACES

A variety of electric furnaces for industrial purposes are being manufactured by the Edison Electric Appliance Company. The Annealing Furnace shown in the illustration has been designed for treatment of carbon steels, for bluing, annealing and preheating high speed steel, where absence



Annealing Furnace

of scale or warping and elimination of dirt common to heating with gas or other fuels is an important consideration. This furnace is constructed to be of special value in work where an exact control of temperature is essential for perfect results.

An Apology

This item was run in our June 1st issue, but owing to a typographical error an extraneous caption was appended which read:

This end view shows the construction of the contact-making members—the arc being broken horizontally rather than vertically

The notice and picture, with corrected caption, are here presented in their proper form by way of apology for the error.

THE "UNIVERSAL" AMMETER

A new device recently put on the market by the Roller-Smith Company of New York is the "Universal" Ammeter. The outstanding feature of this instrument is its universal application to all makes of cars, all makes and types of lighting and starting systems, and all voltage systems. With all the different makes of cars on the market and all the different voltage systems with which they are equipped, it is a very difficult matter for a jobber, dealer, service station or garage to recommend a suitable ammeter to a car owner who is in need of a device of that kind, the principal point being that the ordinary ammeter which is designed for lighting circuit work will not operate under conditions where the ammeter must be installed in the cranking circuit.

With the Roller-Smith "Universal" ammeter it does not make any difference what make and type of car and system is installed, as this instrument has been particularly designed for cranking circuit use and will operate satisfactorily under any conditions. It can be connected in the starting circuit, if necessary, as in the case of certain single unit systems, and the cranking current, no matter how heavy, will not injure it.

The diameter of the body is 2 in., and the depth behind the flange ⅞ in. Each ammeter is furnished with a full supply of mounting screws and nuts and washers.

A NEW SWITCH

A new locomotive Headlight Switch has made its appearance. It has a number of features that will quickly appeal not only to the master mechanic but to the engineer.

This headlight switch is a complete, self-contained, dust-tight switch that will effectively take the place of a double-throw knife switch for dim and full light, and a momentary contact switch for temporary dim light.

With an easy push the handle goes from "Off" to "Dim" and another slight push sends it to "Full." Going into "Dim" before going into "Full" gives the filament a chance to heat before coming to full glow. That means a long life for lamps.

While passing another locomotive or for picking up signals, it is not necessary to bring the switch back to the "Permanent Dim" position. The engineer merely pushes the handle from "Full" to "Temporary Dim" holding it until he has passed the other train or the signals, when he releases the handle and the switch automatically snaps back to "Full."

If going through a yard or city where the Headlight must be "Dim," a slight lift of the handle brings the Switch back to the permanent dim position.

This handy little Switch, which is manufactured by the Crouse-Hinds Company, of Syracuse, N. Y., can be mounted anywhere in the cab that is suitable. The mechanism cannot get out of order. The internal spring and the stops on the cover insure proper location of the Switch at the position desired, and make it impossible for the switch to stop between positions.

MOVING TONNAGE IN LARGE UNITS

The ability to increase track capacity requirements of heavy freight trains is fast becoming a difficult problem, owing to the tremendous increase in train tonnages to be moved as a unit. In other words, the problem before many steam railroad operators is how to increase the physical capacity of a certain heavy tonnage division without prohibitive expense. At the same time, after such an expenditure in correcting alignment, grade reductions and other operating difficulties, there still remains the problem of operation, namely hauling without delay the tonnage offered for transit.

With the introduction of the large FF1-250-ton locomotive of the Pennsylvania Railroad recently exhibited at the Master Mechanics and Master Car Builders Convention held at Atlantic City, new achievements are possible in moving heavy tonnage in large units over steep grades. The locomotive has a horsepower of 7600, with a sustained horsepower capacity of 4800 for one hour. With two of these engines a 6300 ton train can easily be handled up long grades at constant speed: for instance, on a 25-mile 1% grade such a train could be moved at 20.6 miles per hour.

The Pennsylvania FF1 locomotive was built within existing operating limits, reaching the maximum starting drawbar pull which average freight cars will permit, the maximum tractive effort consistent with the wheel arrangement used, the maximum weight on drivers, the maximum horsepower per unit weight, and the maximum speed considered desirable for contemplated operation.

This locomotive was designed under the general direction of Mr. J. T. Wallis, General Superintendent of Motive Power, Pennsylvania Railroad, together with Mr. B. G. Lamme, Chief Engineer, Westinghouse Electric & Manufacturing Company.

Books and Bulletins

Transformer Standards

A booklet on Transformer Standards just issued by the National Electric Light Association is the authoritative publication on the subject, covering types, frequencies, sizes, voltage ratings, taps and lead markings. It was prepared by the Electrical Apparatus Committee of the National Electric Light Association and is based on the cooperative effort of both operating companies and manufacturers.

The general adoption of these standards is now assured, and is expected to result in material benefit to users of transformers both standard and special.

Bureau of Mines

Bulletin 165 of the Bureau of Mines, "The Bibliography of Petroleum and Allied Substances in 1916," is the work of E. H. Burroughs. It follows the same general scheme as the 1915 bibliography, giving a list of all publications examined, technical journals and official publications, and classifying the material of the articles under geographical and subject-matter headings.

"The Method of Administering Leases of Iron Ore Deposits Belonging to the State of Minnesota," by J. R. Finlay, is Technical Paper 222 published by the Bureau of Mines.

Bulletins 177 and 179 of the Bureau of Mines are "The Decline and Ultimate Production of Oil Wells, with Notes on the Valuation of Oil Properties," and "Abstracts of Current Decisions on Mines and Mining, September-December, 1918." They are the work of Carl H. Beal and J. W. Thompson respectively. "Cost Keeping for Small Metals Mines" by J. C. Pickering, and "Metal Mine Accidents in the United States During the Calendar Year 1917" by Albert H. Fay, are the titles of Technical Papers 223 and 224 published by the Bureau of Mines. "Excerpts from Reports of Mineral Investigations of the Bureau of Mines for May, 1919," published by the Bureau in multigraph form, contains data compiled by J. E. Spurr.

Electric Furnace

An artistic booklet is issued by the Electric Furnace Construction Company, Finance Building, Philadelphia, describing and illustrating the Greaves-Etchells Electric Steel Furnace. It includes, also, a discussion of the various uses of the electric furnace, and a comparative table of output of furnaces.

Household Appliances

A novel illustrated folder is sent out by the Edison Electric Appliance Company for the assistance of distributors of the Hughes Electric Range. The Hotpoint Division of the same company issues a folder of sales helps for dealers in the Hotpoint household appliances. A parts list and parts price list of the latter appliances have also been issued.

The Electric Iron is the subject of a small 2-color folder sent out by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. It is entitled "The Aristocrat of the Laundry."

Electrical Gifts

The Commercial Section of the National Electric Light Association has arranged an attractive little Christmas folder on Electric Gifts, for use by the industry. Copies for distribution may be ordered through the Publication Committee of the Commercial Section.

Measurements of Gas and Air

The Cutler-Hammer Manufacturing Company of Milwaukee, Wis., sends out a 16-page two-color booklet entitled "The Value of Accurate Measurements of Gases and Air." The booklet is well illustrated with numerous photographs and diagrams, and contains interesting data on the subject of gas measurement.

Annual Report

In spite of its strictly business-like title, the Eighth Annual Report of the Toronto Hydro-Electric System, recently issued, is a most pleasing booklet, artistically bound in buff and blue, and printed on heavy cream paper with numerous illustrations. It covers activities for the year 1918.

Bureau of Standards

The Bureau of Standards issues as Technologic Paper No. 119, "The Ultra Violet and Visible Transmission of Eye-Protective Glasses," the joint work of K. S. Gibson and H. J. McNicholas, Assistant Physicists, Bureau of Standards.

Label Series

The General Electric Company, of Schenectady, N. Y., has designed a new and attractive series of box labels for use by electrical dealers. The labels are of various sizes and each bears a picture, effectively executed in blue and orange, illustrating a single electrical convenience in actual use. They are effective in window displays, and on the boxes in the store interior they almost do the work of a salesman.

Centrifugal Pumps

An adequate and well-arranged booklet is issued by the Pelton Water Wheel Company describing and illustrating the essential features of the various designs of Pelton Centrifugal pumps, with suggestions on installing and operating, and a table of data on flooding land.

Labor Saving Devices

The Hurley Machine Company, of Chicago, publishes a comprehensive illustrated booklet dealing with Thor electric washing machines, ironing machines and vacuum cleaners. Complete descriptions of the various types are given, their prices, method of installation and operation, together with computations of the savings involved.

Electrical Insulation

A new booklet on their electric insulating material has been sent out by the Chicago Mica Company of Valparaiso, Indiana, covering moulding mica, plates, spools, brush holders, special rheostat insulation, oiled tapes, and numerous other developments.

From the Dolph Manufacturing Company of 95 Liberty St., New York, comes a useful card listing their insulating varnishes, with a solvent chart on the reverse side.

Miscellaneous

A descriptive booklet has been received from the Jewelll Electrical Instrument Company, of Chicago, outlining their organization, factory plan, and new catalog, and listing their representatives.

A booklet with two-color illustrations on Nuttall gears for tractors is sent out by the Tractor Department of the R. D. Nuttall Company, Conway Building, Chicago.

The July 4th issue of the "C-H Messenger," the Cutler-Hammer publication, contains lists and photographs of Cutler-Hammer members in the service of the United States during the war.

The Benjamin Two-Way Plug and its uses are advertised in two new street car cards and an effective wall-hanger sent out by the Benjamin Electric Manufacturing Company of Chicago, Illinois.

The advantages of the Rex-Lite as a factory light are presented in a small folder issued by the Intermountain Electric Company of Fourth South St., Salt Lake City.

The National Metal Molding Company of Pittsburgh has sent out a large and effective folder on the subject of Inter-Connecting Metal Moldings.

NEW ELECTRICAL DEVELOPMENTS

(Extension of electric light service and new plant construction in Seattle feature in the Northwestern news, together with tentative plans for an electric railroad. City improvements, in service and equipment, are reported in the Pacific Central region. From the Pacific Southwest comes news of important bond issues connected with power development, while the Intermountain district shows activity along several lines, including street railway and lighting systems.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—The Seattle Electric Washer Company has been incorporated by Thomas A. Gaynor and others for $10,000.

TACOMA, WASH.—A $300,000 bond issue for the purchase of the Lake Cushman power site will come up for vote on August 12.

SEATTLE, WASH.—The county commissioners have granted a permit to the Pacific Coast Coal Company for construction of an electric power transmission line from a point near Renton, along the Renton-Newcastle county road.

GRAND MOUND, WASH.—NePage, McKenny Company, Armour Building, Seattle, have been awarded the contract for electric wiring in the cottage being erected at the school for girls at this place by the State Board of Control at a cost of $2957.

SALEM, ORE.—Articles of incorporation have been filed by the Sumpter Power & Water Company, capitalized at $25,000, with headquarters in Baker, Ore. The incorporators are M. E. Weed and W. A. Weed, both of Oregon, and A. G. Smith of Washington.

PORTLAND, ORE.—Extension of steam and electric mains planned and now under construction by the Northwestern Electric Company will involve an expenditure of more than $100,000, according to G. C. Pierce, vice-president and general manager of the company.

ESTACADA, ORE.—A number of surveyors and a crew of men are at work at South Fork. It is currently reported that the Pacific Railway, Light & Power Company is reviving the project of building a new power plant there, which was abandoned on account of the war.

SEATTLE, WASH.—The Puget Sound Traction Light & Power Company, Seattle, is remodeling completely the second floor of its large office building at Seventh avenue and Olive street, Seattle, to meet new conditions brought about by the sale of its street car lines to the city.

SALEM, ORE.—Approximately $750,000 of the bonds for the Warm Springs irrigation district at Vale have already been sold and the additional $400,000 now advertised will make $1,500,000 to be applied to the completion of a dam and main canals for 29,000 acres at an average of $46.60 an acre. Part of the water will be derived from Malheur river.

THE DALLES, ORE.—A special election held recently approved the $65,000 improvement bonds submitted to the voters. The voters authorized the following improvements: the paving of the link from the east end of Second street at $35,000; the paving of Upper Union, West Ninth, $12,000; the construction of a concrete bridge over Mill Creek on West Sixth street, costing $14,500.

BEND, ORE.—That extensive developments of the silica beds, 11 miles from Terrebonne, will be made this year by the Western Diatomite Company was indicated when the company presented a $1000 check to be used in road improvement to the county court. Greatly increased hauling would necessitate putting the road in better condition, stated the letter which accompanied the check. The county already has $5000 available for the work.

SALEM, ORE.—On a geological examination of the Benham Falls reservoir site in Deschutes county, to begin soon after the middle of the present month, depends the apportionment of government money for construction of the big pond which is planned to feed water to more than 200,000 acres along the Deschutes river. The government money will be available, if the site is approved under a bill appropriating $500,000,000 for drainage, irrigation and land settlement which doubtless will pass Congress shortly.

CORVALLIS, ORE.—Excavation has started for the $70,000 engineering laboratory building at Oregon Agricultural College authorized by the legislature, the contract having been let to Hoover & McNeil, of Albany, at approximately $70,000. J. V. Bennes, of Portland, is the architect. It will be a two-story structure with basement, 220 by 63 feet in size, of brick and concrete construction and resembling a modern industrial plant. The boiler for heating the building will furnish steam for use in the engines installed in the laboratory. Underground tanks will be installed with pumps for furnishing water to the hydraulic laboratory.

VANCOUVER, WASH.—Nine thousand acres of land will be drained this year in Clarke county, which includes the draining of Vancouver lake and Shallow pool. The work was authorized by the county commissioners at their regular monthly session. The work will be done under supervision of the state drainage engineer and will cost approximately $65 an acre. When complete it is estimated the cost of the work will amount to $600,000. Part of the cost will be shared by the property owners and no objections were put before the commissioners when the question was settled. There are about 100 residents of the county who own this property.

SEATTLE, WASH.—Proposing a plan by which the cost of extension of electric light service to residences not located on established circuits of the company will largely be borne by the consumer for whose benefit the extension is made, the Puget Sound Traction Light & Power Company, Seattle, has filed a schedule of tariffs with the public service commission which under the thirty-day provision of the law becomes effective August 8th if approved by the commission. The old tariffs are not changed as to the kilowatt hour consumption, but so as to affect the minimum rate charged the consumer who requires an extension to secure service.

TACOMA, WASH.—The Tacoma, Washington, city council has offered the Tacoma Railway & Power Company $1,500,000 for its street car lines within the city, providing a vote of the people sanctions the purchase. Under the offer the railway company would also agree to finance a loan of a million dollars to the city for the purpose of putting the lines in first-class condition. In the past the railway and power company has placed a valuation of $6,000,000 on its lines. The action of the council follows a recommendation of a committee of citizens appointed to consider the street railway problem. This committee decided that the lines would be unable to pay expenses under any fare that the people would stand.

SALEM, ORE.—Articles have been filed for the Portland & Southwestern Railway Company, by H. S. Huson and others, for $2,000,000 to construct a railroad from the Boundary line of Portland through the Waldo Hills and Santiam section to Bend. While no announcement is made it is generally understood that the new railroad will depend upon electricity for its motive power, leases for power site purposes having been obtained on Marion Lake in the Santiam National Forest in Curry county. Marion Lake has great power possibilities and is considered to have a potentiality of 30,000 to 40,000 horsepower. The railway company has its offices in Portland. The Myler Construction Company will build the line, according to report.

SEATTLE, WASH.—Construction of a steam plant adjoining the present plant on Lake Union has been authorized by the city council, the bill having passed favoring the extension and authorizing the issuance and sale of $1,250,000 of light and power utility bonds to cover the cost. J. D. Ross, superintendent of lighting, gave to the council a communication setting forth an inquiry from the Tivani Steel Company asking the city if $20,000 horsepower can be had at $10 per horsepower for 5 years as an inducement for the company to build a steel plant in the city, the first unit to cost about $5,000,000. An eight-bent concrete building 120 by 80 feet with full basement will house the new unit of the power plant. Plans are being prepared by City Architect Daniel Huntington.

THE PACIFIC CENTRAL DISTRICT

FRESNO, CAL.—The Pacific Gas & Electric Company is making improvements in Fresno. At the new plant the company is now building a warehouse, garage, machine shop and a big gas holder.

UKIAH, CAL.—S. H. Busch has contracted with Richard Carter for the construction of a dam on his property to impound the waters of Boyes Creek for irrigation purposes. The dam will be built of reinforced concrete and will be 50 feet long, 30 feet high and 5 feet wide at the base.

CHICO, CAL.—A group of Glenn county rice growers, who propose to construct a plant for the generation of power for their own use, have taken an option on the water right and power site of Denny Murphy on Deer Creek, near Polk Springs. Preliminary investigations have indicated that the project is feasible.

SAN FRANCISCO, CAL.—The supervisors have passed an ordinance granting permission to the Ocean Shore Railroad Company, a corporation, to construct a track leading from its track on 12th street to its property on Mission street, and requiring the company to perform certain work in connection therewith.

CHICO, CAL.—Chico will not purchase the electrical distributing system of Pacific Gas & Electric Company or the Northern California Power Company for operating a municipal power plant, but will build its own electrical distributing system and power plant. This decision was made by the Board of Trustees.

RICHMOND, CAL.—This city is considering the installation of 117 additional electroliers in the downtown district. Each of the proposed electroliers would cost $47.50 per year to operate at 400 candlepower—a total of $5557.50 per year for the entire system. The city council has ordered a survey of the light situation and a comparison of prices.

PITTSBURGH, CAL.—Six thousand acres of land north of the abandoned Solano City townsite, which is half-way between the Sacramento river and Sacramento City, on the line of the Oakland, Antioch and Eastern Railway, have been planted to rice. A new irrigation company

is being formed to irrigate about 40,000 acres of the old Solano Irrigated Farms Company's lands in that section.

DURHAM, CAL.—In an order issued by the Railroad Commission recently the Pacific Gas & Electric Company is authorized to purchase from J. A. and Edith Foster of Durham, Butte county, the Durham Light and Power Company. The Pacific Company is to pay for the plant $15,000 cash and $10,000 par value in fully paid shares of the first preferred capital stock of the gas company.

OROVILLE, CAL. — According to an announcement made here, at least 3000 men will be employed by the Great Western Power Company within the next few months near Lake Almanor, where a tunnel is to be constructed by that company to carry water to Butte Valley from Lake Almanor. A force of carpenters is now at work constructing bunk houses, kitchens and other accommodations for the workmen who will arrive in the near future.

MODESTO, CAL.—Directors of the Turlock and Modesto irrigation districts announce that they have acquired deeds or options on over 6000 acres of Tuolumne county land on the site of the proposed Don Pedro reservoir above Groveland. The reservoir will cover 6,760 acres, 744 acres of which are still to be purchased. The proposed dam will cost $3,750,000. When completed it will impound 260,000 acre feet of water.

TERRA BELLA, CAL.—At the last meeting of the board of directors of the Terra Bella irrigation district, a tentative agreement was made with B. B. Harrison, president of the Canadian Investments of California, Inc., for the inclusion of 322 acres of foothill land in the district. This district will expend around $20,000 in new equipment and rearrangement of pipe lines, in order to serve the lands to be included.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has under way plans for the addition of 15 feet to its dam at Lake Spaulding, one of the company's reservoirs above Emigrant Gap, near the summit of the Sierra Nevadas. In 1916 the dam was raised to the height of 260 feet above stream level and to a capacity of 63,900 acre feet. The addition, it is estimated, will make the capacity 65,000 to 66,000 acre feet.

FRESNO, CAL.—Power development on Kings river, which will eventually result in the construction of a $50,000,000 project producing 200,000 horsepower, is beginning to take shape with the construction by five engineering crews of a road up the north fork to an elevation of 7800 ft. As soon as the $5,000,000 San Joaquin River Kerchoff power project is completed in April, 1920, the equipment will be taken to the Kings River site, and the first unit of the 200,000 horsepower plant will be constructed.

MAYFIELD, CAL.—This town defeated by two votes a proposition to bond the city for $20,000 for the purchase from the Pacific Gas & Electric Company of its distributing system here. It was proposed to take over this property and distribute light and power purchased at wholesale from the company. Bonds amounting to $15,000 were voted by considerable majorities as follows: For erecting a town hall, $5000; for sinking another well, $5000, and $5000 for extending and replacing water mains.

WILLOWS, CAL.—An eight-foot screw pump of the syphon type has arrived at the headgates of the Sacramento Valley West Side Canal Company and is being installed to supply more water for the canal system. The pump has a capacity of 350 second feet of water, weighs 10,000 pounds and requires a 450 horsepower motor to operate it. Upon the completion of the installation, which will require two or three weeks, two of the present turbine pumps will be put out of commission and held in reserve as auxiliary equipment.

THE PACIFIC SOUTHWEST

CALEXICO, CAL.—At an election held recently the proposal to issue $325,000 in bonds to establish electric light and gas plants was defeated.

ANAHEIM, CAL.—The project for the Bolsa Drainage District Organization carried at a recent election. Steps will be taken at once on construction work.

AVALON, CAL.—Bonds to the amount of $88,000 have been voted for the construction of an electric light plant and water works system, and $55,000 for a gas plant.

LOS ANGELES, CAL.—The Board of Public Utilities has instructed the Los Angeles Railway Corporation to prepare for double-tracking its line on new Broadway between Tenth and Pico streets.

LOS ANGELES, CAL.—Application has been filed with the State Water Commission by Geo. Robinson for permission to appropriate one cubic foot per second of the waters of Nine Mile Canyon, Inyo county, for agricultural purposes. Diversion works to consist of a concrete dam 12 ft. high, 40 ft. long, and a one-mile pipe line. The estimated cost is $5,000.

RIVERSIDE, CAL.—Southern Sierra Power Company has applied to the Railroad Commission for authority to issue $620,246.52 par value first and refunding mortgage gold bonds, the issue representing 85 per cent of moneys expended by the corporation since December 1, 1914, in extensions, additions and betterments. The proceeds are to be used to reimburse the treasury.

LOS ANGELES, CAL.—The Railroad Commission has granted to the Southern California Edison Company authority to guarantee $1,150,000 5 per cent serial bonds, to be issued by the Shaver Lake Lumber Company, a corporation to be formed in connection with the power company's plans to purchase the properties of the Fresno Flume and Lumber Company for use in a power development program. Under the plans of the utility the power company will acquire a reservoir site and properties which it can use in its hydroelectric development scheme, while the Shaver Lake Lumber Company will secure the timber lands and all other property. The company estimates the value of the properties, including the timber, at $1,400,000. The time to issue 50,000 shares of its common capital stock has been extended to August 1, 1920. The time granted in the order authorizing the stock issue will expire on August 1 of this year.

THE INTER-MOUNTAIN DISTRICT

MINIDOKA, IDA.—Plans for a lighting system to be erected on four concrete posts in each block have been approved by the mayor and city council.

ELKO, NEV.—Arrangements are under way to establish a model village for the Indians, equipped with electric lights, city water, etc., and both a grammar and a high school.

SALT LAKE CITY, UTAH.—The Dixie Power Company has submitted to the Public Utilities Commission a standard form of contract to be used in soliciting all classes of new business. The new form has been approved by the Commission.

MILLVILLE, UTAH.—The town of Millville has advertised for bids for the construction of a complete electric distribution system for lighting the town. Current will probably be purchased at wholesale from the Utah Power & Light Company.

SALT LAKE CITY, UTAH.—Six new electric cars for the Salt Lake, Garfield and Western Railroad Company, for operation between Salt Lake City and Saltair Beach have arrived in this city and will be put in operation before the end of July.

SALT LAKE CITY, UTAH.—Plans are nearing completion for irrigation by the use of electric pumping plants of approximately 6000 acres of land in the south end of Davis county, near Salt Lake City. Action was taken by the farmers of that district on account of the extremely dry season this year, which they do not care to experience again.

SALT LAKE CITY, UTAH.—To supply electric energy for machinery and trucks used in highway construction, the State Road Commission will erect a power line from Cedar City to St. George. The line will be constructed along the Dixie Power Company's right of way and later will be sold to the Dixie Power Company. Current for their operations will be furnished by the Dixie Company.

MORONI, UTAH.—The Big Springs Electric Company has petitioned the Public Utilities Commission of Utah for permission to abolish flat rates, which is one of the schedules charged by it for furnishing electric service. The company desires to have all of its patrons on a measured service basis and alleges wasteful and illegal use of current under the flat rate system. The company serves Fountain Green and Moroni with current.

SALT LAKE CITY, UTAH.—Owing to prompt action on the part of Utah Power & Light officials in releasing a large amount of water from storage in Bear Lake for irrigation purposes, a large number of the crops in the Bear Lake district have been saved from almost total loss on account of the extremely hot dry weather. The farmers in this district are very profuse in their praise of the kindness of the company officials for their assistance.

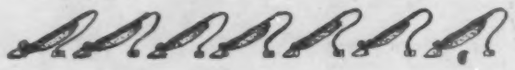
BUTTE, MONT.—The Montana Power Company is planning to extend its transmission lines to the east central agricultural belt of Montana. The Montana company will take over the plant of the Roundup Electric Company. The mining properties of the Republic and Roundup Coal Mining Companies, it is understood, will be equipped for electrical operation. Energy will be supplied by either the Great Falls power station or the Madison River plant, near Bozeman. The cost of the proposed work will be about $500,000.

BEAVER CITY, UTAH.—Application for the use of 25 second feet of water from the Beaver River for power purposes has been filed with the State Engineer by Beaver City, through its mayor, D. I. Frazer. The city operates a municipal power plant and the service furnished has been declared unsatisfactory by certain protestants. Under the plans outlined in the application, the city would take 25 second feet from the Beaver River by a small diversion dam, convey it 15,000 feet along the stream in a pipe line 36 inches in diameter, and drop it over two six foot Pelton wheels under a 250 foot head. This will develop 400 horsepower.

DENVER, COLO.—By a decision, concurred in by four of the seven judges, the Colorado Supreme Court reaffirmed its former decision in the case of the city of Denver against the Mountain States Telephone and Telegraph Company and the Colorado Public Utilities Commission, involving the question of control of public service corporations in home-rule cities operating under charters granted by the twentieth amendment to the state constitution. Applied to Denver utilities, the decision means that the increase in telephone rates, in effect since July 1, 1918, is null and void; that the seven-cent car fare and one-cent transfer charge given the Tramway company is of no effect and that the Tramway company must comply with the five-cent fare ordered into effect by the city council recently; and that the Denver Gas & Electric Light Company again must furnish gas for domestic use at 80 cents net for each 1,000 cubic feet, and at 60 cents for each 1,000 cubic feet used for industrial purposes. While they realize they have nothing further to hope from the Colorado courts, the utility managers, it is reported, are already laying plans to litigate the question further by going into the federal courts.

THE VACUUM CLEANER —— THE VACUUM CLEANER

A SCRAP OF PAPER started a war. The scraps of paper represented by these items among the rich treasure trove of the office Vacuum Cleaner are not so belligerent in their consequences, perhaps, but they are warranted to start something—if only a smile. This page is not an advertisement—it is not a deliberate funny page—it is made up of just those odd happenings of serious or comic import which usually are lost to any but conversational channels. The Vacuum Cleaner is the official collector of such scraps about the usual office and so it has been chosen as an appropriate sponsor for the matter here appearing.—The Editor.



Trapped by a secret sliding panel door, Walter Lacey, manager of the Western Electric Company, Oakland, Cal., was locked for hours recently in an inner chamber of a den in San Francisco's Chinatown that not even the police had heretofore known existed. The party of which Lacey was a member was being shown through Chinatown's underground by Policemen Emmet Moore and Walter Vogel. They were exploring the Siberia Club in Ross alley, one of the most notorious dens of its day. Moore's electric torch gave out. The two policemen went to get another light and asked the party to remain a moment in one of the lower rooms. One of the party had some matches. In exploring around with these he touched a secret spring. It opened a door which looked like the one through which they had entered. They passed through the door and it snapped shut behind them. They were trapped. It was not until the cries and shouts of the party were heard by a passing Chinese that they were released. It took half an hour to chop open the door with axes.

He doesn't, apparently as you may judge by reading the details below. The author is unknown, but we may credit Metal Trades with having been the first to discover him.

THE WAIL OF GOODY BOY

My parents forbade me to smoke
I don't.
Nor listen to a naughty joke
I don't.
They made it clear I must not wink
At pretty girls, nor even think
About intoxicating drink
I don't.
To dance or flirt is very wrong.
Wild youths chase women, wine and song
I don't.
I kiss no girls, not even one,
I do not know how it is done,
You wouldn't think I have much fun
I don't.

Author Unknown
(For obvious reasons).

The "cold shoulder" which we speak of today is reported to have entered our vocabulary by way of France. It seems that the tactful French once had a habit of serving a cold shoulder of mutton instead of hot meat to a guest who had stayed longer than he was welcome. We have other delicate hints in use under present custom, but the phrase, if not the fact, has maintained its significance of chilly lack of welcome.

The Tired Business Man, preferably in the electrical industry, is advised by the Boston News Bureau to take the following exercises regularly before breakfast:

HOW TO GET CARE AND TROUBLE OUT OF THE SYSTEM

1. Rise 7:00 a.m.
2. Stand in middle of room. Raise arms slowly overhead, take deep breath and say "Damn the Government," lowering arms in attitude of despair. Ten times.
3. Extend body, face downward, on floor. Cover eyes with hands. Kick heels, think of the railroads, and weep. Till Dry.
4. Kneel. Wring hands. Meditate upon the labor unions and groan, 150 times.
5. Assume sitting position. Hands on hips. Sway gently to and fro and concentrate upon Mr. Burleson until a generous frothing at the mouth sets in. Till exhausted.
6. Collapse on floor. Grovel vigorously. Think of the income tax and gnash teeth as in anger. Ad. Lib.
7. NOTE: Observe this simple regime every morning before breakfast and you will reach the office with most of the cares and troubles of the day already out of your system.

"Where they have to wash on Monday" is the title of a brief item copied by B. L. T. from the Rothsay, Minn., Enterprise. It reads:

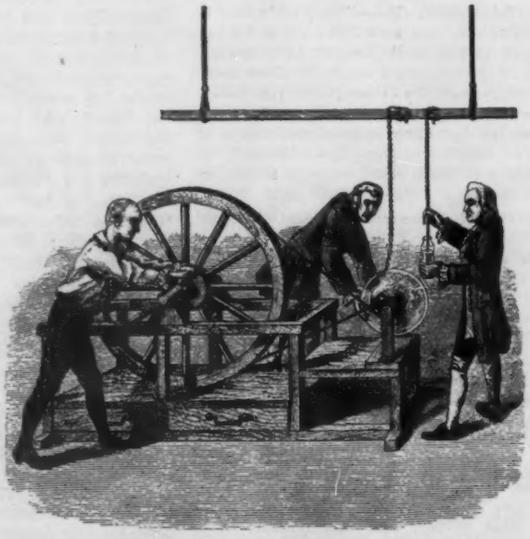
The Rothsay lighting power plant will be run every Tuesday in the future between the hours of 8 and 10 a.m., for the purpose of supplying current for the electric flat irons in use.

It is interesting to note that it is taken for granted all ironing is done electrically.

ENGINEERS OF YESTERDAY—14.

Van Musschenbroek

(Series compiled by A. L. Jordan)



Who attempted to "electrify water in a bottle" and said he would not take another such shock for the kingdom of France?

Pieter van Musschenbroek (whose native city, in Holland, gives us the name "Leyden Jar") in 1746 was experimenting with the frictional electric machine, invented by von Guericke, with the above results. The honor of this discovery he shares, however, with von Kleist of Pomerania, who made the discovery independently at about the same time. Another invention of Musschenbroek's is the pyrometer for high temperature measurements, based upon the expansion of a metallic rod.

THE VACUUM CLEANER —— THE VACUUM CLEANER